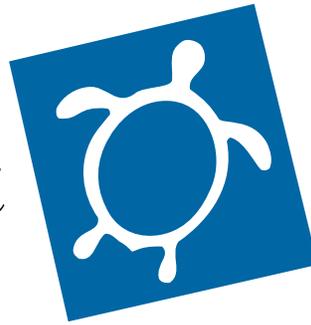


# Environment



# Hawai'i

a monthly newsletter

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## Tuna Meltdown

When it comes to tuna, especially prized bigeye tuna, fishing just isn't what it used to be. Long gone, and never to be seen again, are the days when no one – at least no authority – cared how many fish were caught or where. Now, in both the eastern and western Pacific, Hawai'i's longline vessels are up against quotas that will, if enforced, have a meaningful impact on their bottom lines.

Yet as necessary as the quotas are to restoring tuna stocks, the longliners seem determined to circumvent them in the western Pacific. While claiming that their charter agreement with American Samoa is not a ruse, it is indisputable that if the agreement proceeds, it will undercut the goal of reducing the number of bigeye killed by fishing.

## Hawai'i Longliners Attempt an End Run Around Bigeye Quotas in Western Pacific

For the first time, the Hawai'i longline fleet is operating under catch limits for its most lucrative haul – bigeye tuna – throughout virtually the entire area it fishes. Yet the trade group representing the 125 or so longline vessels sailing out of Honolulu has attempted to make an end run around the new quota in the western and central Pacific. In fact, if all goes according to plan, the fleet will actually be able to *increase* its catch from that area by 12 percent over what it hauled in last year.

The quota in the western and central Pacific (waters west of 150° West longitude) was imposed last December, when the multi-nation Western and Central Pacific Fishery Commission (WCPFC) adopted a measure to address overfishing of bigeye by requiring most member states to cut their catches. Stocks of bigeye tuna were found to be plummeting to the point where they were less than



Pacific bigeye tuna

PHOTO: NOAA

a quarter of the population estimated to exist before industrial fishing began, according to a stock assessment prepared for the commission. The commission responded by imposing restrictions whose stated purpose was to achieve “a minimum of 30 percent reduction in bigeye tuna fishing mortality from the annual average during the period 2001-2004.”

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## Marine, Native Forest Bird and Plant Habitats Will All Suffer Under Climate Change Scenarios

I don't think we're licked yet,” said one of the more optimistic presenters at this year's Hawai'i Conservation Conference. But while he and several other speakers insisted that it's not too late to try to protect Hawai'i's natural resources from the predicted effects of climate change, it was difficult for many of those at the conference not to succumb to the “gloom and doom” that resource managers and scientists laid out in one sobering talk after another.

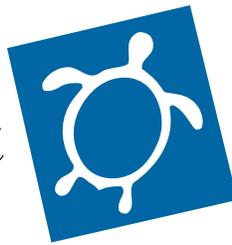
In March 2008, the Hawai'i Conservation Alliance held a two-day forum on some of the latest research in Hawai'i regarding climate change. The information presented at the forum was limited and in some cases very

preliminary, but at this year's annual conference, sponsored by the HCA, presenters brought into sharper focus the effects climate change is having on Hawai'i, the environmental changes the islands can expect over the next several decades, and what managers are planning to do to cope with them.

Held at the Hawai'i Convention Center July 28 to 30, most of the talks centered around the conference theme, “Hawai'i in a Changing Climate: Ecological, Cultural, Economic, and Policy Challenges and Solutions.” Several sessions also addressed more traditional research and management issues, as well as indigenous management approaches.

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# Environment



# Hawai'i

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## NEW AND NOTEWORTHY

**Snail v. Snail v. Rat:** The enemy of my enemy is my friend. That may be a concise description of the findings of two University of Hawai'i researchers into the predation of black rats on two species of invasive snails, the giant African snail, *Achatina fulica*, and the predatory snail *Euglandina rosea*. The researchers, Wallace Meyer III, of the university's Department of Zoology, and Aaron Shiels, of the Department of Botany, wanted to know what might happen if rats, whose predation on native endangered snails is well documented, were eradicated from the snails' habitat. Would the populations of non-native snails, uncontrolled by the rats, explode to the point they'd pose a threat to the natives?

Sadly, the answer seems to be yes. As Meyer and Shiels report in the July 2009 issue of *Pacific Science*, the "reduction or eradication of *R. rattus* [the black rat] populations may cause an

ecological release of some nonindigenous snail species where these groups coexist. As such, effective restoration for native snails and plants may not be realized after *R. rattus* removal in forest ecosystems as a consequence of the complex interactions that currently exist among rats, nonindigenous snails, and the remaining food web."

With rat control efforts in conservation areas on the increase, Meyer and Shiels warn that "the complex interactions among *R. rattus* and nonindigenous snail species... suggest that managers should proceed cautiously with management and control efforts that involve these species." Removing rats from the Wai'anae mountains, where resource managers are trying to protect native snail habitat, "may result in *E. rosea* population increases," the authors write. "This may have negative effects on native snail populations, which may be irreversible..." (See "Black Rat (*Rattus rattus*) Predation on Nonindigenous Snails in Hawai'i: Complex Management Implications," *Pacific Science*, 63: 339-347.)

**Kaukonahua Comments:** The state Department of Health has completed its assessment of sources of pollution in the Upper Kaukonahua Stream (North Fork and South Fork), in central O'ahu. A public hearing on the proposed Total Daily Maximum Load (TMDL) for nitrogen and turbidity in these stream sections was scheduled for August 28; the deadline for comments is September 8.

Close readers of last month's *Environment Hawai'i* may recall that a TMDL study for Kaukonahua Stream was said by the DOH to be necessary before the agency could issue a National Pollutant Discharge Elimination System permit to the City and County of Honolulu to

cover releases from its wastewater treatment plant that discharges into Lake Wilson, which also receives flows from the Upper Kaukonahua Stream.

Necessary, perhaps, but not sufficient. Apparently more studies are needed before the DOH has the information required to set discharge requirements for the city's wastewater plant.

If the upper reaches of Kaukonahua Stream are cleaned up enough to meet the TMDLs proposed, the DOH says, this should lead to improved water quality in Lake Wilson (also known as Wahiawa Reservoir), as well as the lower reaches of the stream and, eventually, Kaiaka Bay on O'ahu's North Shore. "However, the extent to which water quality standards will be attained in Wahiawa Reservoir and further downstream largely depends upon the manner in which Wahiawa Reservoir, its other pollutant sources, and its irrigation uses are operated and managed in the future," the report says.

To review the document or learn more about how to submit comments, see: <http://hawaii.gov/health/environmental/env-planning/index.html>.

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### Quote of the Month

"I know mosquitoes... I know they're not that organized."

— **Dennis LaPointe, USGS**



**Give Aloha – Please!** It's that time of year again, when your donations to *Environment Hawai'i* can be leveraged with a partial match from Foodland. Throughout September, shoppers at any Foodland or Sack 'n' Save store can donate up to \$249 when they pay for groceries at check-out. To earmark your donation for *Environment Hawai'i*, you need to give the cashier our identifying number: **77036**. (Don't worry: if you forget, the cashier will have an alphabetical list of qualifying charities that will have our number on it.) If you want us to know of your gift and publicize it, please retain your receipt and forward it (or a copy of it) to us.

## Wespac Refuses to Rubberstamp Budget; Public Will Be Able to See It Before Vote

For Kitty Simonds, executive director of the Western Pacific Fishery Management Council, what happened on Saturday, July 25, must have felt like a palace coup.

At the tail end of a four-day meeting of the council in Kona, Simonds had scheduled a discussion on administrative and budget matters.

Under normal circumstances, it's a safe bet that most members of the public would have long ago left, their patience having been sorely tried by inane and ridiculous comments of some council members, or their capacity for boredom having been pushed to the limit by tedious PowerPoint presentations.

Under normal circumstances, the discussions of council administrative and budget issues might just as well be held in closed session, for all the attention the public pays.

But July's meeting was, so far as this part of the council's agenda was concerned, any-

receives all its funds through a process of applying for and receiving grants from the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce. The process of developing a new five-year budget began last year, Simonds said. Now, "what you have is a draft budget with numbers, and what [the National Marine Fisheries Service] suggested to the councils is that we do a 5 to 10 percent increase every year. We don't know what we're going to get... This budget is based on what the administration asked Congress for in 2010.... [It] describes the work we plan to do based on our history."

At that point, a member of the audience asked why no copies of the budget were available for the public to review.

"We want the council members to review the document first," Simonds said. "It's a draft document."

She then went on to impress on council

*"[U]nless you give the public information... it is very difficult for any of us to be able to defend ourselves against accusations of wrongful misconduct."*

**— Laura Thielen, council member**

thing but normal. It was the first meeting of Wespac since the Government Accountability Office issued its long-awaited report last May on the council's operations. And while that report stopped short of confirming the worst suspicions of many council critics about Simonds' management, it kindled interest among certain council observers in agenda items that stray far from the more customary discussions of the health of fish stocks or presentations on the number of active boats in American Samoa's fledgling longline fleet.

Council chairman Sean Martin called the council to order shortly after 11 a.m. on that Saturday. He and others apparently thought the remainder of the agenda could be dealt with in short order, announcing to members that lunch would be available for them in the neighboring council staff room at the conclusion of the meeting.

With that, he let Simonds have the floor.

"Two sets of financial reports have been distributed," Simonds said. "One is a short version, with line items and totals. The other is a bit more detailed, with staff travel."

"As you know," she continued, "this is the last year of our five-year grant." The council

members the importance of quick action in approving the budget. "We all [council executives] said we were going to send [NMFS] budgets in September because the new year begins in January. The [congressional] conference appears to be working very quickly on appropriations."

Former state Department of Land and Natural Resources administrator Peter Young, who now sits on the council, reminded Simonds that despite her stated desire that council members review the document before giving it to the public, he and other council members had been given no advance copy. "I observed the budget committee" (which met earlier in the week), he said. "The executive committee was given a budget and discussed it on Wednesday.... There's a lot of numbers and information in here. And council members who are not members of the budget or executive committee are put at a serious disadvantage when they are not able to get this document in advance of the meeting – but also when it's clear that other council members have copies, but not everyone is given one...."

"I believe there's an expectation we're

supposed to vote on it, and have an understanding of what it is we're voting on. So I can understand the frustration of the public, not even being able to get a copy of it, but I wanted to express my frustration, disappointment, and disagreement that there are two classes of council members with respect to getting the information."

Laura Thielen, who sits on the council by virtue of her position as current DLNR administrator, announced she wanted "time to look through the materials" – at which point Simonds dramatically rolled her eyes.

But Thielen persevered. She quickly pointed out that categories such as "international management," "policy development," and "outreach" contained big increases over previous years. "This is a lot of information," she said. "Can we have some time to read through this and come back at the next meeting and have some comment and discussion?"

Simonds was thrown off by Thielen's question: "Where are you?" she asked, not knowing what pages in the inch-thick document Thielen was referring to.

"The multiyear summary, fiscal year '09 to fiscal year 15," Thielen responded.

Simonds was dismissive: "Start with the administration [budget of] \$2.7 million."

Thielen could not find Simonds' starting point.

After several moments of discussion and murmurs among the council members and staff, it emerged that not all council members had been given the same documents.

"This illustrates the point," Thielen then said. "We have a lot of information here. I want a chance to look through it and I want a chance to ask questions before we approve it. Is this multiyear summary I have – is that the proposal the council is making? If that's the case, it doesn't correlate with the information you just said."

Simonds tried again: "What you're looking at here is supposed to be a 10 percent increase annually, on the advice of NMFS. Unless we know the cost for something is different."

Thielen: "If I'm told I get a 10 percent



Council member from Guam Manuel Duenas (left) and council executive director Kitty Simonds.

increase in my total budget, I don't just do a 10 percent across-the-board" increase.

At that point, the council took a break so its staff could scramble to get all members copies of the same documents. Afterward, Young chimed in to support Thielen: "I support Laura's statement about the need for more time.... I think it's unreasonable to expect that we would be able to vote on it today before lunch."

"Laura, so how much time do you think you need?" Simonds asked Thielen. (Simonds earlier had instructed Young not to speak to her.) "What are you asking for?"

"I'd like an opportunity to read through the materials and then come back with the questions. And make sure we —"

Simonds interrupted, announcing that the council would "need to have a teleconference on the five-year budget some time in the next week," seeming to ride roughshod over *Federal Notice* requirements for such meetings.

There followed a lengthy discussion of whether members of the public could be trusted not to confuse budget documents clearly stamped "DRAFT" with final budgets. According to Fred Tucher, general council for the Pacific Islands Regional Office of NMFS, the council could choose to make any document it wanted public, so long as legal prohibitions on release of confidential or proprietary data were not breached. Martin noted that before the council could take any action to approve the budget, "we have to have public comment" — which in turn implied that, at some point, sooner or later, the public would need to see what the council was voting upon.

In the end, the council decided to put off any further discussion of the budget until members had been given sufficient time to review it. After the motion was made, Thielen suggested an amendment: "I would add that the materials, upon distribution to council members, also be posted publicly for review during the discussion of that meeting... Draft materials for this meeting should be distributed and made available for the public no later than two weeks before the conference call."

Martin again expressed his reservations: "Although documents may clearly be marked as draft documents, there is a potential for misinterpretation of those draft documents prior to them being formalized."

Thielen pressed her point harder: "All we're looking at in this motion is giving the council members time to receive the accurate information on the budget we're being asked to vote on, giving us enough time

prior to having that publicly noticed meeting to make a decision, to inform ourselves — and also making that information available to people who are going to listen in on that publicly noticed meeting. That's all that's in the motion....

"What we've found... in Hawai'i, is that unless you give the public information, there is a cloud over the council members, and it is very difficult for any of us to be able to defend ourselves against accusations of wrongful misconduct. There are two reasons for having public information out there. One is so that the public trusts the public process. The other is to protect the volunteers who serve on these councils and boards and commissions by providing that transparency so they can say, 'I followed that process.' If someone objects, they can say that.

"There have been a lot of questions about how this council makes decisions... I very strongly believe we should have these materials available to the public... Putting them on the website is a very good way."

By that time, Thielen had either persuaded or worn down most of the other council members. (Simonds had left the room long before the matter came to a vote.)

But it was left to Guam council member Manny Duenas to voice a last, desperate — and bizarre — argument against the proposal of Thielen and others that council materials be made available online. The motion, he said, "is highly discriminatory to the people of Guam. They're not technologically literate."

Despite the stated concerns of Martin and Duenas, the motion passed unanimously.



## The GAO Report

July's meeting gave the council its first opportunity to discuss the report issued last May by the Government Accountability Office on the operations of Wespac and allegations of mismanagement. Most of that discussion concerned the GAO's criticism that the council's operations were not transparent to the public.

The advisory measures in the report were directed to the National Oceanic and Atmospheric Administration, not to the council, which technically is a contractor to NOAA. On July 13, William Robinson, administrator of the Pacific Islands Regional Office of NOAA's National Marine Fisheries Service, transmitted to council chairman Sean Martin recommendations based on the GAO's findings.

First, with respect to reports that Wespac



Peter Young

and its director, Simonds, were overstepping federal limits on lobbying activities, Robinson instructed the council "to maintain documentation of all requests for information from federal and state legislators."

Second, with respect to reports that council staff or contractors were handing out cash in white envelopes to participants at certain council-sponsored meetings, Robinson told Martin that the council must pay per-diem costs by check "to the extent practicable."

Third, to improve "transparency of the council's actions," Robinson proposed that the council undertake five separate measures:

- That NOAA's regional counsel give council members and staff an annual briefing on rules governing their conduct, with the first meeting to occur during the council's October meeting;
- That the council adopt procedures to ensure that meeting minutes contain not only a council member's recusal but also the reasons for it;
- That it place council meeting minutes and briefing materials on its website, with this task to be done no later than October 1;
- That it adopt procedures "to provide greater access to council information and ensure the public is aware of the types of records that are available to the public at the council office and the procedures for reviewing these records;"
- Finally, that the council adopt procedures "to ensure a full and timely response" to the requests of council members for information needed in the course of their duties.

The GAO report had noted that materials in council briefing books (which can be hundreds of pages long) are routinely placed on the websites of other fishery management councils, while briefing materials at Wespac meetings are available to the public only during the portion of the agenda in which the materials are being discussed — and only some of those materials, at that.

Although Simonds indicated that this problem would be addressed when the new IT person on the council's staff got up to speed, it turned out that all the briefing materials were in fact available online – but only to council members, on a password-protected website.

Council member Peter Young pointed

**“I, for one, like paper...”**

**— Manuel Duenas, council member**

out that it would have been a simple matter to make the materials available online to the public, “but we made it password-protected. The only people who had access were the members. We ended up killing trees because we have to distribute copies at the meeting. We had a great opportunity to demonstrate to the public that we could [be more transparent], but we didn't. And to add further

insult, we didn't even distribute to members documents at the time they were available.”

Other council members remarked on how convenient it was to have all the council materials available on their laptops during the meeting. David Itano said, “I have a hard time getting my hands on the right

piece of paper, but when I have the documents on the computer, I can go through them. I prefer this... I can flip through my screen and get what I want.”

Don Palawski, representing the Fish and Wildlife Service, agreed.

Only Manny Duenas dissented. “I, for one, like paper.... I get insulted because people are on computers” during the meet-

ing, he said, since he has seen members playing video games or watching sports channels.

Regardless of whether or how quickly the council complies with the request that it put more information on its website, it seems clear that the public will finally be able to have online access to critical council records in the near future. In his letter forwarding GAO recommendations to the council, PIRO administrator Robinson announced that by December 1, his office was intending to post meeting minutes and other council records on its own website ([www.fpir.noaa.gov](http://www.fpir.noaa.gov)).

“NMFS will include procedures for submitting a FOIA [Freedom of Information Act] request for NMFS and council records on this website” as well, Robinson said.

**— P.T.**

#### ***Tuna from page 1***

A special exemption was carved out for the Hawai'i longliners, though, which face a mandatory cut of just 10 percent from the catch recorded in 2004. The less harsh treatment for the longliners, explained William Gibbons-Fly, the State Department official who represented the United States at the talks last December, was won at some difficulty. “We were in a room where all the other developed countries... were prepared to agree to reductions in their longline fleet of 10 percent this year and each year for the next two,” Gibbons-Fly said at the July meeting of the Western Pacific Fishery Management Council (Wespac), the agency that makes recommendations to the National Marine Fisheries Service on fishing measures in U.S. waters around Hawai'i, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and remote U.S.-flagged islands in the Pacific.

“Based on conversations we had with longline representatives from the United States that the longline fleet in Hawai'i has different characteristics from longline fleets in other countries that operate big freezer vessels, we argued that the Hawai'i fleet deserves special treatment, since it addresses the fresh fish market. We got the commission to agree that the Hawai'i longline fleet would have only a 10 percent cut one year, and no cuts after that.”

In the final language of the commission's measure, Gibbons-Fly continued, “criteria were developed to apply specifically to the U.S. fleet without mentioning the U.S. fleet

by name. It's not easy to sit in a room with 26 other countries and say you want a special deal. But we did it, and were happy to defend the interests of the fleet in Hawai'i.”

Use of the 2004 catch as a baseline instead of the 2001-2004 average was also a special nod to Hawai'i, Gibbons-Fly noted. This resulted from the regulatory turmoil in the longline fishery during the early years of the decade, when litigation over the fleet's harm to sea turtles closed the longline fishery for a time.

#### ***Second Helpings***

But the favors granted to the Hawai'i fleet were not enough to satisfy the members of the Hawai'i Longline Association. Exploiting language in the WCPFC measure that allowed a 2,000-metric-ton limit on bigeye catches to “participating territories” and which altogether exempted from any quotas “small island developing state members and participating territories... undertaking responsible development of their domestic fisheries,” the HLA worked out a “charter agreement” with American Samoa, allowing HLA vessels to take up to 1,500 metric tons of its quota.

Under the 10 percent cut, the Hawai'i longliners would be allowed to catch no more than 3,763 metric tons (8.3 million pounds) of bigeye tuna in the area under WCPFC's jurisdiction, an amount that is roughly 20 percent below the fleet's average annual catch of bigeye in the western Pacific for the years 2005-2008. With the American Samoa deal, however, the total catch allowed to Hawai'i vessels soars nearly 30 percent, to 5,263 metric tons (11.6 million pounds). That figure is only

slightly less than the 11.8 million pounds of bigeye from the western Pacific that was landed by the Hawai'i longliners in 2007, a record year.

What's more, not one of the bigeye tunas caught under the additional allotment provided for in the agreement would have to be caught in waters around American Samoa – or even landed there.

#### ***Is it a Ruse?***

According to William Robinson, head of the Pacific Islands Regional Office of NMFS, he had been told by HLA representatives that they were trying to work something out with American Samoa, but had no details until well after the deal was signed on April 20. In May, he and Gibbons-Fly of the State Department participated in a conference call with past Wespac chair Jim Cook, HLA's legal affairs coordinator (and co-owner with current chair Sean Martin of several longline vessels). Robinson and Gibbons-Fly apparently voiced some skepticism over the motives of HLA in entering into the agreement.

In a follow-up letter to them of May 21, Cook attempted to address this point. “We understand that there are concerns that the charter agreement is, in effect, a ruse to circumvent bigeye tuna fishing limits imposed under the Western and Central Pacific Fisheries Convention [sic],” Cook said. He made no secret of the fact that HLA had “an economic incentive to enter into this charter agreement,” but went on to say that this fact “neither renders the contract a ruse nor negates American Samoa's legitimate purposes” in signing the pact. Cook pointed to the need

of American Samoa “to tangibly and responsibly promote development of its commercial fisheries,” U.S. support for which, he added, “has not materialized.”

Cook characterized the charter agreement as requiring “substantial legitimate contributions toward funding the needed infrastructure ... and toward training local fishermen and shoreside workers to perform essential functions.” Yet no language in the agreement backs up this claim. Instead, the HLA is merely to provide vessels that American Samoa can charter: as the agreement itself defines the term, “*Charter*” means that an Operator [i.e., HLA member] provides a U.S. flagged Vessel, equipped with crew and other necessary personnel, who shall remain the servants of the Operator, for the use of Territory under this Agreement...” No mention is made of requiring that some part of the crew be from American Samoa, nor is there any requirement that HLA directly give the territory funds to support training or build infrastructure.

According to Cook, it was representatives of the territorial government who requested “that the sums negotiated under the agreement be placed in the Western Pacific Sustainable Fisheries Fund... These funds – up to a quarter of a million dollars in 2009 [actually \$225,000 per the agreement] – are dedicated to responsible fisheries development in American Samoa, including, for example, pier construction and other capital improvements essential ... to locating a viable commercial fishery in American Samoa.”

Under the Magnuson-Stevens Act (MSA), the sustainable fisheries fund is to receive payments from foreign fleets authorized to fish in U.S. waters and to receive fines and penalties from vessels found to be illegally fishing in those waters. While the fund is to help pay for improvements called for in the marine conservation plans for Hawai'i, the U.S. territories as well as the remote U.S.-flagged islands, whether the fund can even receive donations of the type proposed in the HLA-American Samoa agreement is a question that has not yet been resolved. The MSA is unclear on this point.

Cook defended the agreement as providing American Samoa with a “charter fishery that is ‘integral’ and that makes an important contribution toward ‘responsible development of domestic fisheries.’”

“Respectfully, we think suggestions by NMFS and [the State Department] in our discussions that the Government of American Samoa may have no role in determining

what is ‘integral’ and what is ‘responsible’ for American Samoa, and that agencies of the U.S. government know better, harkens back to a bygone era of colonialism that has no foundations in the provisions of [the WCPFC measure], current U.S. law and U.S. policy.”

### ***Rules of the Road***

In July, the National Marine Fisheries Service published a proposed regulation to implement the WCPFC conservation and management measure for U.S. catches of bigeye by the longline fleet. (Regulation of the U.S. purse seine fleet, which represents the largest part of the bigeye catch, was undertaken in a separate rule-making a month earlier.)

The draft rule blasted HLA’s agreement out of the water. NMFS proposed to treat bigeye tuna landed in Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands “as fish that are harvested in support of the development of their domestic fisheries.” The requirement that fish

***NMFS’ proposed rule “reveals an almost willful lack of consideration of the wider perspective...”***

**— Kitty Simonds, Wespac executive director**

actually be landed in a territory thwarts the HLA’s evident intention to be able to use the quota of American Samoa without having to bring fish to port there.

The draft rule continued, noting: “As a general rule, tuna taken within the [Exclusive Economic Zone] around Hawai'i have been landed in Hawai'i, and have acquired no direct or indirect connection to the fisheries of any of these three participating territories.” If the fish were caught in the EEZs around the territories and landed there, however, they “would not be subject to the limit” imposed on U.S. longliners.

The only meaningful comments came from an attorney representing the Hawai'i Longline Association and from Wespac. Both had lengthy objections.

HLA attorney Jeffrey W. Leppo, of the Seattle firm Stoel Rives, argued that the proposed rules would erect “new barriers specifically designed to block American Samoa, Guam and CNMI from fishing under their separate [bigeye tuna] catch limits.”

In some 14 pages of comments, Leppo assails NMFS’ interpretation of the WCPFC measure. Agreements such as HLA’s with American Samoa, Leppo argued, were in fact encouraged by the WCPFC: “the WCPFC intended to promote longline [bigeye tuna] fisheries development in participating territories,” he wrote, “including through the use of charters, leases and other similar mecha-

nisms.” Neither the Magnuson-Stevens Act nor its regulations, Leppo continued, “address charter agreements as contemplated [by WCPFC] and as executed by American Samoa.” With the U.S. having signed on to the WCPFC measure, he argued, “NMFS is not authorized to adopt implementing regulations that circumvent the express provisions” of the measure, and it cannot “pick and choose among those provisions [of the measure] it likes and dislikes so as to implement one of WCPFC’s laudable purposes (bigeye tuna conservation) while entirely frustrating another clear, important and laudable purpose (development of bigeye tuna fisheries of participating territories)...”

Leppo described NMFS’ proposed rule as “hurried and ill-considered” and “contrary to applicable international and domestic law, and otherwise unsound.”

Those were kind words compared to what Kitty Simonds, executive director of Wespac, wrote in her comments. NMFS’ proposed

rule “reveals an almost willful lack of consideration of the wider perspective in terms of potential impacts of the bigeye catch limit,” she said. It represents “a narrow, myopic interpretation” of the WCPFC measure and significantly impacts “the legitimate rights of the U.S. territories.”

### ***‘Final Action’ in October***

At its July meeting in Kona, in a session that went until nearly midnight, the Western Pacific Fishery Management Council discussed the proposed rule. Vice chairman Manny Duenas, of Guam, argued that the requirement that longliners land their catch in the territory against whose quota the catch counts was unfair, since no similar requirement is imposed on purse seiners. Gibbons-Fly testily disputed that: “You’re wrong on this—as you are on so many other” points, he said.

In the end, the council approved a recommendation that NMFS revise its draft rule, to allow a vessel’s catch to be attributed to its permit rather than to its landing location. According to the council’s press release, Guam, American Samoa, and CNMI have been precluded from using charters as a means of reaching their bigeye tuna catch limits by the regulatory structure of the council’s current fishery management plan (FMP).

“The council will take final action at its

October 2009 meeting on such amendments to the Pelagics FMP as may be necessary to more effectively utilize these limits, such as allowing U.S. participating territories to enter into agreements and arrangements with U.S. fishing vessels and U.S. fishing entities," according to the press release.

Current projections suggest that the Hawai'i longliners will hit the 3,763-metric-ton catch limit on bigeye around November 1. According to one source at NMFS' Honolulu office, publication of a final rule on the bigeye tuna quota for longline vessels won't occur until perhaps October.

While the quota applies only to bigeye tuna, it is at this point an open question whether longline vessels will be allowed to continue to fish for other species or whether they will be required, once the quota is reached, to avoid the waters under WCPFC jurisdiction altogether. The Pelagic Plan Team, which advises Wespac on matters relating to the management of open-ocean fisheries, commented on this problem in its report to the council last July:

"The Plan Team recommends that the Council, in its consideration of approaches to implement the WCPFC bigeye tuna catch limit, consider the implications if the Hawai'i-based longline fleet is allowed to continue to fish in the Western and Central Pacific Ocean once the WCPFC bigeye tuna catch limit has been reached. Vessels may target other tuna species which may have implications on current WCPFC conservation and management measures for ... yellowfin and North Pacific albacore. Further, if vessels continue to fish, [bigeye tuna] will be caught and discarded. Although many [bigeye tuna] discards may survive, additional mortality would occur, contrary to the intent of the WCPFC limit to reduce mortality. The Pelagic Plan Team recommends research on the post-release mortality of longline caught bigeye tuna."

Another option to deal with the catch quota—one that avoids both the problem of fishing for other species while continuing to catch (and discard) bigeye tuna and the alternative of having vessels sit in port for the last two months of the year, when bigeye tuna is in high demand—is to distribute catch privileges to longline vessels. While a so-called LAPP (for Limited Access Privilege Program) would be difficult to develop in the short term, in the long term, it has several advantages. First, it does away with the derby aspect of quotas (which occurs when boats race to catch as much of the quota as they can) by allocating shares of the quota to the vessels participating in the fishery. Second, it avoids market-disrupt-

ing fishery closures, by allowing holders of fishery shares to set their lines whenever they wish, so long as they have not reached their limit.

In recent Wespac meetings, the prospect of developing a LAPP for bigeye tuna has been the subject of long discussions. With the WCPFC quota now a reality, those discussions are sure to take on new urgency at the October meeting.

### **Bottom Lines**

As part of the rule-making process, NMFS performed a regulatory impact analysis, which, among other things, looked at the costs and benefits that the proposed rule would have. Charles Karnella of NMFS' Honolulu office did the analysis, which found that the average loss in revenues for each vessel under the new catch quotas would be between \$100,000 and \$200,000. (According to Karnella's report, average annual vessel revenue for the longline fleet before the quota was roughly \$500,000.)

But Karnella also pointed out the benefits. "The proposed action can be expected to have a positive effect on net benefits that the United States can potentially enjoy through the maintenance of a productive [western and central Pacific Ocean] bigeye tuna stock," he wrote. "Those effects, however, cannot be quantified and they would occur only if the other fishing nations ... implement similar actions ... or more conservation actions beyond the three-year duration of this WCPFC-mandated action."

On the whole, Karnella's summation of the effects of the quota left little doubt as to his glum view: The WCPFC measures "are intended ... to achieve the desired 30 percent reduction in fishing mortality. However, given a number of compromises and exemptions available [in the measure], it is clear that the collective longline and purse seine measures are unlikely, even if fully implemented by all the WCPFC members, to result in the desired 30 percent reduction." Still, he continued, "the likely cumulative effect ... is not nil, and any fisheries exploiting ... bigeye tuna, including the Hawai'i longline fleet, would benefit from that effect."

In a phone interview, Karnella said that many things in the WCPFC measure, adopted in haste, don't make sense or make it difficult to implement. With respect to the provisions regarding developing island states, he said, "they can catch an unlimited amount of bigeye. If they license distant-water fishing nations to fish in their waters, that's not likely to result in a reduction of the catch of bigeye.

"On the one hand, you don't want to

prevent developing states to enter into the fishery, but it doesn't do anyone any good if you allow the fishery to be overfished. It doesn't help them. It doesn't help anyone."



## Yellowfin Cuts

Under the December measure taken by Western and Central Pacific Fisheries Commission, catch reductions are imposed on purse seiners and longliners taking yellowfin tuna as well as bigeye. In general, no more yellowfin can be taken than were caught by participating nations on average between 2001 and 2004 or, in the case of Hawai'i longliners, the catch reported in 2004.

For Hawai'i, that means the yellowfin catches from the western and central Pacific cannot exceed 694 metric tons (1,526,800 pounds) for the current year through 2011. NMFS has told the Western Pacific Fishery Management Council that it will not be making any rules to enforce this cap and that finding ways to address this measure would be up to the council.



## Meanwhile, in the Eastern Pacific

Five years ago, a quota was placed on catches of bigeye in the eastern Pacific (east of 150° West meridian). That lapsed for several years, but this year, it is being imposed again by the Inter-American Tropical Tuna Commission (IATTC). Purse seiners, which catch juvenile bigeye when targeting other tunas, cannot fish for specified periods—starting at 59 days in 2009, increasing to 62 days in 2010, and up to 73 days in 2011. In general, the longline catches of each member are not to exceed 500 metric tons a year or the weight of their catch in 2001, whichever is greater.

In 2001, the total catch of the domestic longline fleet, composed of Hawai'i and California boats, came to 150 metric tons. More recently, however, the Hawai'i fleet alone has taken in catches ranging from 79 metric tons (in 2006) to 1,275 mt (in 2008), with an average annual catch of 579 mt for the 2005-2008 period. At the same time that the Hawai'i share has grown, the California proportion has shrunk. In recent years, just three longliners have operated from the U.S. west coast.

But whether the IATTC cap will have the desired effect of reducing bigeye catches is a matter of some dispute.

**HCA from page 1**

To judge from many of the talks, the outlook for Hawai'i is bleak, especially for the northwestern islands. Regarding the state's terrestrial environment, predicted changes in precipitation and temperature are likely to leave little or no suitable habitat for many native plants and forest birds.

**Drying Up**

Without water, there is no life. And according to long-term rainfall and stream flow data, Hawai'i's water supply already appears to be dwindling.

Tom Giambelluca, a climatologist at the University of Hawai'i, has studied how climate change may be affecting the tradewind inversion (TWI) and temperature in Hawai'i. He's found that in recent decades, the air temperature at night and at higher elevations has been increasing rapidly and significantly, up 0.79 degrees Fahrenheit per decade over the past 30 years. The temperature increase at the high elevations has been three times as great as at the lower elevations, he found. And because the state's most intact native ecosystems are located at higher elevations, Giambelluca said, he's fairly certain that climate change, which predicts greater warming across elevations, is "going to have an impact on our native biota."

According to Giambelluca, the inversion, which traps moist air below the cloud line, has become more frequent in the last 15 or so years and has also gotten lower. A lower TWI means shallower clouds, which

**Tuna from 7**

Paragraph 1 of the IATTC resolution C-09-01, which imposes the bigeye quotas, states that it is applicable from 2009 to 2011 to all purse seiners of more than 187 metric tons carrying capacity and to all longline vessels over 24 meters (about 78 feet) that target yellowfin, bigeye, and skipjack tuna in the eastern Pacific Ocean. Most Hawai'i longline vessels are long enough to be subject to the quotas.

The reasoning behind the exemption, according to one NMFS source, is that some Latin American countries "wanted it in there because they have so-called artisanal fleets with vessels under 24 meters in length. The resolution seems to say, 'go for it' if you're less than 24 meters."

Rule-making to implement the IATTC resolution is being handled by NMFS' Southwest Regional office, in Long Beach.

— **Patricia Tummons**

produce less rain and leave a larger area above the clouds with no moisture. While Giambelluca said he's not sure whether the TWI trend is a result of global warming, he did say it has resulted in a 10-15 percent loss in precipitation.

In addition to the TWI trend, over the last 30 years, there has also been a weakening of the tradewind field surrounding the islands and to the southeast of the chain. This, according to Henry Diaz of the University of Colorado at Boulder, can have an effect on cloud cover and also on air temperatures.

Data from 1961 to 2003 show a 17 percent decline in annual rainfall, and a 27

**"We're on a treadmill of management actions and climate change speeds up that treadmill."**

**— Jonathan Price, UH-Hilo**

percent decline in the average winter rainfall, he said, adding, "That's a lot."

He said that global temperature data from the National Oceanic and Atmospheric Administration does not show what the increases in air surface temperatures have been over Hawai'i, only that there has been a less-than-average increase in sea surface temperature. However, Diaz said, his work with Giambelluca shows that the air temperature over Hawai'i between 1950 and 2006 has increased by 1 degree Celsius, three times as much as the sea surface temperature. He added that changes in *nearshore* sea surface temperatures have mirrored that trend.

Under "middle of the road" emission scenarios of global climate models used by the Intergovernmental Panel on Climate Change, the temperature around Hawai'i is expected to increase by 2 degrees Celsius (about 3.5 degrees Fahrenheit) by 2100. This increase would result in more frequent and intense extreme temperatures as well as more frequent heavy rains.

Diaz added that models he and Oliver Timm of the University of Hawai'i have developed reveal that Hawai'i's summers will become wetter and winters will be drier.

Complementing Diaz's and Giambelluca's findings about decreasing rainfall, Gordon Tribble, the Hawai'i and Pacific director of water programs for the U.S. Geological Survey, presented data, published in a 2004 USGS report by Delwyn Oki, showing that base stream flows in Hawai'i have also decreased over the past 100 or so years.

In his study, Oki looked at the base flow

at seven stream stations across the state — on Kaua'i's Wailua River, on Kaukonahua and Kalihi streams on O'ahu, on Moloka'i's Halawa Stream, and on Honokohau, Hanawi, and Honopou streams on Maui. The stations had been operating since at least 1913 and the streams at the station point had not been affected by pumping or diversions.

Oki found that stream flow decreased significantly at four of the seven stations (Kalihi, Halawa, Hanawi, and Honopou). For example, Tribble said that from 1910 to 2000, Halawa Stream's average annual base flow declined from ten cubic feet per second (cfs) to between five and seven cfs.

With regard to Hawai'i's drying trend, Tribble said that the tradewind inversion "has no doubt played a part."

**Poor Plants**

To estimate how the predicted precipitation and temperature changes will affect Hawai'i's ecosystems, Jonathan Price of the University of Hawai'i at Hilo, Loyal Merhoff and James Jacobi of the USGS Biological Resources Discipline, Giambelluca, Timm, and Diaz developed models to produce potential range maps for 1,167 native Hawaiian vascular plants. Using the climate models Diaz, Giambelluca and Timm have downscaled to predict temperature and moisture changes in different climatic regions in Hawai'i, as well as existing information on current environmental conditions (elevation, moisture, and substrate age), the researchers predicted the plants' habitat ranges in the last three decades of this century.

Their preliminary results suggest that both wet- and dry-forest communities will be acutely affected by the disruption of the "moisture-temperature combination." During his conference presentation, Price showed maps of how various climatic zones on each island will be affected. The coolest habitats, "the tops of any mountain, effectively," will be lost by 2100, he said. "That's simply a function of warming.... The amount of alpine climate would certainly diminish," he said.

Hawai'i also stands to lose much of its cool, high-elevation wet forests, the researchers found. While the elevation of the tradewind inversion layer appears to be something that would stay in place, Price

said, temperatures are predicted to rise. So what is now relatively cool, wet habitat just under the inversion layer would become warm and wet, he said. Drier montane forest habitat may expand, he added.

The habitats of certain plants will shrink severely, he continued. For example, the Ko'olau akoko (*Chamaesyce celastroides* var. *amplectens*), which lives along the wet summits of O'ahu's entire Ko'olau mountain range, will be able to survive only on two of the range's highest points. The same goes for certain *Cyanea* species that live in cool, wet habitats on the islands of Hawai'i and Kaua'i, which will be restricted to only one small point on each island. The habitats suitable for the invasive strawberry guava, on the other hand, will expand greatly, Price said, adding that many of the traits (high reproductive and dispersal rates) that make non-natives problematic also make them potentially more adaptable to climate change.

Despite the dire results, Price is optimistic about managing the effects of climate change. Although he did not include any suggestions during his presentation, he did so last year when he spoke at the conference.

"I would have liked to have reiterated them since the rest of the talk was a downer," he told *Environment Hawai'i*. He pointed out that both native and non-native species are going to adjust to climate change and are already undergoing constant change with new invasive species arriving and previous invasions expanding and filling in.

"We're on a treadmill of management actions and climate change speeds up that treadmill," he says. But pollen and fossil records revealing how species responded to the last ice age suggest that some native species respond more quickly than others to climate changes.

"So in terms of management, we can make some assessment about how native species are going to respond, facilitate native species responses and preclude the invasive plant responses to changes. In a lot of ways, the management actions we would take are similar to what we're doing... The future will be like the present, only more so," he says.

David Burney, director of conservation for the National Tropical Botanical Garden on Kaua'i, said that if plants are going to be stranded by habitats that shift too quickly for the plants to keep up with, they will have to be moved by managers, and "not like in the old Disney 'Fantasia' movie where the trees get up and walk." The problem, however, will be finding suitable habitats for relocation, he said.

Coastal strand vegetation may have to be moved inland to protect it from sea level rise, while changes in the TWI may force managers to create relocation opportunities for populations at higher elevations, maybe even on other islands, he said.

Burney added that because biological invasions may increase with climate change, "we are going to have to be willing to kill for conservation." And to create new habitats, he said, drastic action may be required.

"We have to literally do earth moving. We have to be able to take places nobody wants...scrape out seed banks and absolutely start over," he said.

### *Bye-bye, Birdie?*

With regard to Hawai'i's native forest birds, Dennis LaPointe, an expert in mosquito-borne diseases with the USGS, reported that a 2 degree Centigrade increase in temperature – which is what several industrialized countries have agreed to try to limit global warming to – will likely result in a population decline for the 'apapane (*Himatione sanguinea*) and almost certainly will drive the 'i'iwi (*Vestiaria coccinea*) to extinction. Sara Hotchkiss of the University of Wisconsin cited the work of LaPointe and his USGS colleagues, which shows that under the same global warming scenario, the Hanawi Natural Area Reserve on Maui would lose more than half of its bird-worthy habitat. According to the study, published earlier this year, the Hakalau Forest National Wildlife Refuge on Hawai'i island would likely lose as much as 96 percent of its best bird habitat.

Jeff Burgett, a recovery biologist with the U.S. Fish and Wildlife Service, also sounded the alarm about the perils native forest birds are facing.

In doing calculations on their "own dime," Burgett and David Leonard of the state Department of Land and Natural Resources' Division of Forestry and Wildlife found that, based on the models prepared by Price and his colleagues on the expected changes in plant species ranges, for some islands, the "disease-free line," considered to be the upper limit of mosquito habitat (currently about 4,000 feet elevation), will be above the treeline by the end of the century. For the island of Kaua'i, which already lacks mosquito-free areas, there will be no safe forest bird habitat, Burgett said.

LaPointe himself, whose

work on mosquitoes and avian malaria has led some to postulate the existence of the "mosquito-line," does not support the idea that mosquitoes will be strictly limited by elevation. During his presentation, LaPointe said, "I know mosquitoes... I know they're not that organized." He added that mosquito distribution is patchy and hard to predict.

In any case, Hawai'i's "thermal refuges" will eventually disappear and will have a useful life of no more than about 100 years, Burgett said.

In addition to the need for action on a global scale to limit warming to less than 2 degrees Centigrade, Burgett said the state also needs a long-term strategy to allow birds to live with disease.

But what can be done? Captive propagation may not be the best long-term strategy, since it's so expensive, Burgett said. A contour pig fence would help keep upper elevation forests mosquito-free, but it's not a century-long solution, he said. Selection for disease resistance may or may not be an option. "There may be none... Evolution may be too slow," he said.

Translocating birds to higher ground is also not a permanent solution, Burgett said, since disease will eventually invade the area and translocation will also impact the source population, as well as their new ecosystem. He added that there are also regulatory hurdles to establishing endangered species outside their home ranges.

Regarding the regulatory hurdles, Burgett asked, "Is it better to have existing species on the wrong island or extinct species on the right island?"

Despite all the shortcomings of the various tools managers have to save Hawai'i's forest birds, Burgett recommended using them anyway. From captive propagation to range expansion and restoration, he said, utilizing these tools to save birds was most



An akoko (*Chamaesyce celastroides* var. *amplectens*) at Kahakuloa on Maui.

definitely *not* pointless. But, he warned, “the clock is ticking.”



## The Life Aquatic

### *A Desert in the Ocean*

According to Jeff Polovina of the National Oceanic and Atmospheric Administration's Pacific Islands Fisheries Science Center, as global temperatures warm, the ocean will become more stratified. The surface will warm faster than the deep, which may make it more difficult for currents to mix the ocean's deep nutrients into shallower waters. The result, Polovina said, will be a drop in nitrogen levels at the same time that more carbon dioxide is being absorbed by the ocean, he said.

The resulting change in the ocean's carbon-to-nitrogen ratio may have an impact on food web structures, Polovina said. For example, phytoplankton that have a high carbon-to-nitrogen ratio have low nutritional value. Species of phytoplankton that thrive in a high carbon-to-nitrogen ratio may edge out those that don't do as well, “and we'll see a change in species going from the base of the food chain all the way up,” he said.

A global ocean satellite chlorophyll sensor (chlorophyll being used as a proxy for surface plankton) shows that Hawai'i lies within an area of low productivity, a subtropical gyre that is basically a biological desert. These areas have a chlorophyll level ranging from about 0.2 mg of carbon per cubic meter down to about zero, he said.

Within these “deserts,” Polovina said, are virtual dead zones – regions with less than .07 mg of carbon per cubic meter. And over the past decade, these dead zones have expanded globally by about 15 percent. The North Pacific “desert” spans 15 to 20 million square kilometers. The rate of expansion, depending on the area, has been about 1 to 4 percent a year.

“They're such big areas that they're adding 800,000 square kilometers of low productivity habitat every year,” he said. He added that the minimum size of the Pacific zones, which grow in the summer and shrink in the winter, has increased 40 percent, from 11 million square km to 14 million square km.

Climate models predicted that these low-productivity zones would increase, but they underestimated the rate and the extent of it, Polovina said. For example, a 2004 publication predicted that by 2050 the area of subtropical gyres (STG) in the southern hemisphere would increase 9.4 percent over their area in the pre-industrial period, and

the northern hemisphere STGs would increase 4 percent in the same time frame. Instead, ocean sensors have determined that gyres in the Pacific and Atlantic have increased between 6.32 and 35.2 percent between 1998 and 2006 alone.

“We're seeing a much more rapid increase than the models predicted,” he said, admitting that the increases reflect just 10 years of data. “The reason for caution in interpreting only a decade of data is that we've had a decade where we've had more La Niña than El Niño events so we haven't really had a balanced decade in terms of the inter-annual variability.” With more El Niño events, the severity of the trend may decrease, but even so, he said, the results so far are an indication of a global warming signature, with impacts for the carrying capacities of both pelagic and nearshore ecosystems.

“The lower the level of plankton, the lower all food webs will be,” he said, adding that the

“We're seeing a much more rapid increase than the models predicted.” — Jeff Polovina, PIFSC

ocean stratification will also result in less deep-water nutrients feeding reef ecosystems.

### *Lost Larvae*

According to Rob Toonen of the Hawai'i Institute of Marine Biology, fish larvae listen for waves and smell far-away leaves to guide them to their ideal habitats. They can even smell the difference between rocks of their home reefs and those of another reef. But climate change-induced ocean acidification and temperature changes may make it harder for larvae to find their way.

In his presentation, Toonen said some evidence suggests that for larvae, changes in the ocean pH “screws up their sense of smell.” He noted also that sound travels better through warmer water, which would mean that a warmer ocean would also affect their hearing.

“So if you change the pH, suddenly they're responding to things they didn't use to respond to, and not responding to things they [did respond to],” he said. “We're changing their cues and what they're looking for... and which direction they're going.”

He showed slides made by one of his students working on the effects of temperature, acidity and food changes in sea urchin larvae. The research suggests that if temperature and food is kept constant, larvae in water with lower pH (such as is predicted in most climate change scenarios for 100 years from now) develop more slowly, can't swim as well, and don't develop the same feeding capabil-

ity. Toonen added that pH changes will also likely reduce fertilization and survival.

However, he added, “[T]his is something that other studies have predicted the exact opposite of.” Some models show that global warming increases the growth rate of larvae. An increased growth rate would, theoretically, also mean greater survival, since the larvae would not spend as much time in the top of the water column, where they can more easily be snatched up by predators. On the other hand, it could inhibit their ability to disperse, since the larvae would not be traveling as far in the ocean.

What will really happen to larvae and their distribution is still unknown, since, Toonen said, “We don't understand how these synergies start to impact each other. The predictions for temperature get overwritten by pH or food and we don't have a predictable pattern anymore.”

Given that uncertainty, as well as the

unpredictability of climate predictions, Toonen said, “We have to build in resiliency... otherwise we will make mistakes and we will fail.”

### *'A Patchwork Quilt'*

“We're seeing our study material disappearing,” local coral reef expert and plenary speaker Paul Jokiel said at the conference. Jokiel, who has led some of the best work in the islands on the effects of increasing ocean acidity on Hawai'i's corals, said that if the atmospheric concentration of carbon dioxide reaches 450 parts per million, it will lead to severe changes in coral cover. By 2096, he said, there will be zero percent of what there is today. He displayed a chart showing the slope of the decline, which he described as “the trajectory of the hand-basket as it goes to hell.”

Kim Selkoe of the HIMB reported that her modeling of ecosystem responses in the Papahānaumokuākea Marine National Monument in the Northwestern Hawaiian Islands found that acidification will affect Laysan, Maro, and Nihoa atolls the most. Maro Reef and French Frigate Shoals will be most impacted by ultra-violet radiation, and Pearl and Hermes Reef will be most affected by disease and bleaching. Necker Island, on the other hand, may be buffered from the worst of the impacts of climate change.

Ronald Hoeke, of the University of Hawai'i's Joint Institute of Marine and Atmospheric Research, also used modeling to



A Laysan albatross (*Phoebastria immutabilis*).

predict coral cover changes in the Pacific. He used Midway Atoll, French Frigate Shoals, O'ahu, and Johnston Atoll as reference sites. In his presentation, he noted that his results were not predictions for those locations, but just provide a general pointer of what will probably happen to coral growth and calcification rates under the temperature changes and carbon dioxide inputs predicted in the "middle of the road" Intergovernmental Panel on Climate Change scenario of 720 ppm of carbon dioxide.

Hoeke found that some regions have higher probabilities of frequent bleaching events, while others may have faster recovery rates. As temperatures increase, the potential for bleaching is the greatest at Midway, he said, where bleaching events have already occurred in 2002 and 2004.

The area with the least potential for coral bleaching is Johnston Atoll. Based on Jokiel's ocean acidification studies, Hoeke established a coral growth curve relative to temperature. Based on his models, temperature changes alone would cause coral growth rates to increase at Midway. Further south, at French Frigate Shoals and O'ahu, growth rates would appear to stay the same, while at Johnston, the most southerly of all sites, they would decline.

But when Hoeke incorporated the effects of bleaching into his models, coral growth rates decline sharply as a result of even just one bleaching event. In nearly every case where bleaching is incorporated into the models, "we're left with no viable coral cover by the year 2100," Hoeke said. The one exception is French Frigate Shoals, where, according to some scenarios, a little coral will survive.

Even so, he said, corals will cease to be significant components of the shallow benthic ecosystem by 2050. If we assume corals have some ability to adapt to thermal tolerances, the picture is somewhat better, he added.

"We've got a lot of gloom and doom here," Hoeke concluded, but he added that the results he presented were based on his models using only general sea surface temperature data and not site-specific data,

which may skew his results. At Pearl and Hermes Reef, for example, the temperature at 20 meters doesn't get as high as the peak surface temperatures he used in his models.

Hoeke said he ran the models with some site-specific data that were not statistically significant. They showed that Hawai'i might not lose its coral cover by the end of the century, but will lose it at the shallower depths more quickly. Because long-term in-situ data is scarce, he said, he cannot make predictions based on it. Still, he said, "Looking at the in situ data, I think we'll have much more of a patchwork quilt" than a wasteland.

### Waterworld

Elizabeth Flint, a wildlife biologist with the U.S. Fish and Wildlife Service, was one of a few conference speakers to address the effects sea level rise will have on species that live in low-lying areas. Some focused on the devastation to human habitats, but Flint offered a qualitative risk assessment of how the 33 species of seabirds in Hawai'i and the central Pacific might be affected by a 25-meter rise in sea level, which is what is predicted if global warming leads to substantial melting of land ice.

And what she found spells disaster for the seabirds: 90 percent of their terrestrial habitat in the Northwestern Hawaiian Islands will disappear.

A rise of one to two meters, which is what is predicted by 2100 due to thermal expan-

sion alone, will be devastating, she said. But the more extreme scenario of a 25-meter rise would wipe out critical habitat in the NWHI for 5,795,000 breeding seabirds. The islets in the Rose Atoll Marine National Monument, located in American Samoa, may be the first to go, she said, adding that their loss would result in the displacement of an additional four million breeding seabirds.

"If you consider the entire population that is dependent on those [low-lying] islands...the number is closer to 14 million in Northwestern Hawaiian Islands and almost that much in the central Pacific," she told *Environment Hawai'i*.

In addition to those islands that would be submerged by such a rise, other islands will become more vulnerable to "wash-overs" and will be "reduced in value because of the higher stand of the ocean," she said.

The Phoenix petrel (*Pterodroma alba*), the Polynesian storm petrel (*Nesofregatta fuliginosa*), the Laysan albatross (*Phoebastria immutabilis*), and the black-footed albatross (*Phoebastria nigripes*) are the most vulnerable to sea level rise because their populations are concentrated on low-lying islands and/or their numbers are so few that they would be unable to establish a new colony.

Given the previous talks about climate change effects to corals and other marine life, Flint said that the numbers could be worse. "We don't know how the marine environment will be affected. What we can do on land is only part of the story," she said.

— *Teresa Dawson*

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## Council Once More Increases Quotas For Bottomfish in Main Hawaiian Islands

In the three years since total allowable catch limits, or TACs, were first set for seven species of highly prized bottomfish around the Main Hawaiian Islands, the annual quotas have steadily grown. From 178,000 pounds the first year, it has now increased to 254,000 pounds for the current year (September 1 to whenever the TAC is reached).

The early TAC is now regarded as having been overly cautious, according to a background paper prepared by staff of the Western Pacific Fishery Management Council (Wespac) that was the basis for discussion of TACs at the council's July meeting in Kona. In contrast to a 2006 stock assessment that found that fishing pressure in the Main Hawaiian Islands was a major factor contributing to overfishing of bottomfish across the archipelago, the background paper stated, a more recent assessment had concluded that bottomfish were no longer experiencing overfishing – although localized depletion in the Main Hawaiian Islands had occurred.

The adoption of the increased quota was not without controversy. Council member Peter Young voiced his concerns: "Each decision we make, all we're doing is harvesting more and more... While I sympathize with the comments from fishermen, if we have no fish, we will have no fishermen."

Young commented on the way in which the health of the Main Hawaiian Islands bottomfish stocks was bolstered by assessing stocks on an archipelagic basis, which includes the far more robust bottomfish populations in the Northwestern Hawaiian Islands. "We continue to mask the status of the bottomfish

fishery in the state of Hawai'i because we blend in the numbers of the Northwestern Hawaiian Islands with the Main Hawaiian Islands," he said. Referring to the impending closure of the NWHI in 2011 to bottomfish fishing, Young said, the Main Hawaiian Islands fish needed to be assessed in their own right: "That way when we talk about fishing we can honestly say we have a problem."

Finally, Young pointed out the unrecorded catches of recreational fishers. "Our responsibility is to consider the status of the fishery as a whole, not just the commercial component," he said. Referring to the annually increasing TACs, he concluded: "We need to stop this trend, because I think we are moving in absolutely the wrong direction."

Council chairman Sean Martin waved away Young's concerns. "Last year, [the TAC] was 241,000 pounds, with a 40 percent risk of overfishing. This year, it's 254,000, with a 39 percent risk of overfishing," he said – underscoring his view that the risk of overfishing in the proposed TAC was minimal.

Laura Thielen, a council member representing the state of Hawai'i, asked whether the TAC would be as high as recommended if only Main Hawaiian Islands fish were included in the stock assessment.

Bill Robinson, head of the National Marine Fisheries Service's Pacific Islands Regional Office, noted that the Main Hawaiian Islands "is a subcomponent" of the archipelagic bottomfish stock. "So the absolutely legal Magnuson Act requirement [to end overfishing] doesn't exist for this subcomponent of the stock."

"However," he went on to say, "in support of Peter, this council can define the stock unit any way it wants to... So the council could develop a management scheme based solely on Main Hawaiian Islands [bottomfish].... Probably it makes a lot of sense to define the stock as

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Main Hawaiian Islands stock, going on into the future."

The recommendation to set a TAC for 2009-2010 at 254,000, with a 39 percent risk of overfishing, passed, with Young abstaining.

Young went on to make a motion that "stock assessments for bottomfish focus on the Main Hawaiian Islands as a single stock."

Robinson noted that there may not be sufficient information to do this, but that the Science Center could be asked to evaluate whether it indeed could achieve this, with a report back to the council at its October meeting. Wespac executive director Kitty Simonds said that the council could recommend that the Main Hawaiian Islands be considered "a discrete management unit... Also, I'd like to remind you that at the 142<sup>nd</sup> meeting, you endorsed... a recommendation that the stock assessment include an analysis of both components, the Northwestern Islands and the Main Hawaiian Islands."

Young was not satisfied. "There's an urgency here, a need to put this in a regulatory format rather than us dancing around the issue."

On a roll-call vote, Young's motion failed. Voting with Young in favor were Thielen, Robinson, and Dave Itano, the only fisheries biologist on the council.

— Patricia Tummons

