



Bats vs. Blades: A Quixotic Struggle

Despite the laudable result of boosting renewable energy production, the proliferation of wind farms in Hawai'i — and the resulting spike in estimated deaths of the Hawaiian hoary bat — is something some are beginning to view with concern, if not outright hostility.

Lacking even the most basic information about the bats, government officials tasked with protecting the animals are struggling to assist the state's various wind farms in their efforts to maintain compliance with laws aimed at protecting rare species.

As our cover story this month illustrates, efforts so far to protect the state's bat population have been based on best guesses — on the animals' needs, their habits, their range ...

A major research push in the works may help fill many critical knowledge gaps, but it will be years before it yields results.

Also in this issue, we continue our coverage of the contested case hearings on the Thirty Meter Telescope and the interim instream flow standards of two dozen East Maui streams and review marine mammal expert Robin Baird's new book.

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Data Gaps Confound Efforts to Limit Harm to Bats Posed by Wind Farms

When the U.S. Fish and Wildlife Service published its recovery plan for the endangered Hawaiian hoary bat in April 1998, it didn't consider wind farms to be a threat to the species. At the time, potential threats included habitat loss, pesticide exposure, a decrease in prey availability, and, possibly, predation, according to the plan.

Times have certainly changed. In 2013, scientists estimated that from 2000 to 2011, between 650,000 and 1.3 million bats were killed at wind facilities in the United States and Canada, with hoary bats making up "the highest proportions of fatalities at most continental U.S. facilities," a state guidance document on the bat states. Not only have wind farms been found to be a major cause of bat fatalities worldwide, their proliferation in Hawai'i is causing some worry among local resource managers, who are seeing bats being taken at unexpectedly high rates.

For example, the Kaheawa Wind Power facility on Maui began spinning its turbines in 2006 and it was expected that those 20 turbines would kill or injure no more than one bat per year. Using that rate, the company was permitted by the state and federal governments to kill up to 20 over the term of the project. By 2014, however, computer modeling showed that there was an 80 percent chance the facility had killed as many as 29 bats, based on a total of eight actual observed takes over the years.

The Kaheawa Wind Power II and Auwahi Wind Energy projects on Maui and the Kawailoa Wind Power project on O'ahu have all experienced the same situation, where modeling has shown that the bats are possibly being killed at a rate much higher than anticipated in their Habitat Conservation Plans (HCP) and associated Incidental

Take Permits (ITP). As of now, only the Kahuku Wind Power project's projected bat take is still within expected limits.

As a result of the higher-than-expected estimates of bat take, all but one of the wind projects have amended or are in the process of amending their HCPs and ITPs, which govern how many bats may be taken by a facility, the type of mitigation required to ensure that a given farm has no negative impact on

the bat population, and the cost and timing of that mitigation.

The Kaheawa Wind Power project, again, as an example, received approval a little more than a year ago from the federal Fish and Wildlife Service and the state Department of Land and Natural Resources' Division of Forestry and Wildlife to amend its HCP and ITP to increase its allowable take of bats from 20 to 50. And more amendments to other plans are pending: Kaheawa Wind Power II is seeking to increase its allowable take by 69 bats, for a total of 80,

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Endangered Hawaiian hoary bat.

PHOTO: FOREST AND KIM STARR.

TMT Contested Case Hearing Costs State Thousands per Day

As the case involving the challenge to the application to build the Thirty Meter Telescope enters its fifth month of testimony and evidence, some government procedure wonks have raised the question: Are contested cases still appropriate for disputes coming before the Board of Land and Natural Resources?

Through January, there had been 40 days of testimony in addition to about a dozen pre-hearing conferences. Retired Judge Riki May Amano, the hearing officer, has now scheduled dates for further testimony through at least the middle of February.



Judge Riki May Amano

All the while, the meter is running at a fast clip. Each day, state employees attending the hearing include a deputy attorney general, a staff member from the Department of Land and Natural Resources' Office of

Conservation and Coastal Lands (both based in Honolulu), and five or six officers from the DLNR's Division of Conservation and Resources Enforcement. In addition, Amano is

paid \$375 an hour (or \$3,000 for an eight-hour day), while the hearing room – the Crown Room of the Naniloa Hotel – costs \$781 a day. A back-of-the-envelope calculation by *Environment Hawai'i* has the total daily costs to the DLNR coming to about \$7,000, a figure that was not disputed by a state employee familiar with the expenses.

This does not include costs to the applicant for the permit, the University of Hawai'i. It has hired the law firm of Carlsmith Ball to represent its interests and often has university employees attending the hearing. Nor does it include time spent by staff outside the hearing to support the proceedings.

When the University of Hawai'i, which is applying for the Conservation District Use Permit to build the TMT, and the non-profit corporation TIO that would oversee the construction completed their presentation of witnesses, Amano apparently believed that the process would move along at a quicker pace, since all but one of the remaining parties are opponents of the telescope who have similar interests.

It has not worked out that way. One of Amano's earliest efforts to push things along came when, in late October, she asked that cross-examinations of witnesses be limited to 30 minutes by each party. That rule, imposed over the objections of many of the TMT opponents, has fallen by the wayside in the intervening months.

Amano also tried to streamline the process by limiting objections to questions posed during cross-examinations to only the party presenting the witness. That practice was adopted early on in the proceeding after several instances when one party would object, another would then object to the objection, and still more would then lodge their objections to the objections.

However, that has meant that during the presentations by witnesses put on by TMT opponents, there have been virtually no meaningful objections and the witnesses, under sympathetic questioning, have, with few exceptions, had free rein to stray far beyond the bounds of their direct testimony.

On January 10, Tim Lui-Kwan, one of the attorneys for the University of Hawai'i, commented on this. "Just seeing how this friendly cross is going," Lui-Kwan told Amano, "I'm thinking, if we're not allowed to object – and I respect your ruling, Judge – one of the ways of actually speeding to speed this along is to have cross-examiners ask direct questions rather than leading to open ended narratives of the witnesses. I think it would go a lot faster that way"

Amano then suggested to Dexter Kaiama, representing TMT opponent KaHEA, the Hawaiian Environmental Alliance, that he give some thought to this concern.

"I understand there may be instances" when this occurred, he replied. "And I think Your Honor has already reminded witnesses when they start to go far from the questions asked. That might be one way, Your Honor. And the other way, I'll try to do a better job of speaking to my clients... I understand the need to try and streamline."

Another Contested Case?

On January 6, 3rd Circuit Judge Greg K. Nakamura issued his written order in the appeal of one of the TMT opponents, Eric Kalani Flores, of the Board of Land and Natural Resources decision to deny his request for a contested case hearing over the board's consent to the University of Hawai'i's sublease of land to the TMT in 2014.

Flores, Nakamura found, "was denied the right to a contested hearing [sic] on the subject Consent to Sublease in violation of his constitutional right to a hearing under Article 12, Section 7 of the Hawai'i State Constitution and Mauna Kea Anaina Hou," referring to the initial appeal of the TMT permit.

In the past, the Land Board has not granted contested-case hearings over land dispositions (except with regard to Alexander & Baldwin's request for a long-term water lease and revocable permits allowing the diversion of East Maui streams). A deputy attorney general confirmed to *Environment Hawai'i* that the state would appeal the ruling.

— Patricia Tummons

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View from proposed TMT site to Mauna Kea summit ridge.

TMT Opponents Present Case As Hearing Enters Fifth Month

January began with the TIO (the TMT International Observatory, LLC) wrapping up its case in support of the Conservation District Use Permit for the Thirty Meter Telescope. Witnesses included two native Hawaiians with doctoral degrees in astronomy or astrophysics: Paul Coleman, a full professor of astronomy at the University of Hawai'i Institute for Astronomy, and Heather Kaluna, a native of the Puna district of the Big Island and now a post-doc fellow with the UH Hawai'i Institute of Geophysics and Planetology.

Both attempted to explain how their pursuit of science did not conflict with their respect for their culture and Hawaiian tradition. Although the TMT opponents were generally reluctant to criticize other native Hawaiians, Coleman and Kaluna were challenged on the authenticity of their practices.

Kealoha Pisciotto, representing Mauna Kea Anaina Hou, asked Kaluna if she considered herself a "traditional cultural practitioner," to which Kaluna replied in the affirmative, explaining how she gave offerings when ascending the mountain and also regarded her work as an astronomer as being part of her cultural practice.

Pisciotto then immediately stated her opinion that Kaluna's testimony was "outside the scope of this contested case hearing, because astronomy is not at issue ... If the TMT were attempting to build a hospital using the same methodology with the same threats to the environment or cultural practices, we would object, but it wouldn't mean we were against health care, so I believe this witness's testimony is outside the scope of this hearing."

When Coleman said he wanted to see the TMT project go forward, Pisciotto then stated that it was "safe to say your idea ... is not really based from a cultural perspective."

Coleman disagreed: For Hawaiians "not to take advantage of this would be going against our culture. I mean, we are scientists. How did we get here in the first place? You don't find the Hawaiian islands in the middle of the Pacific without knowing science, and particularly astronomy. It's impossible."

Pisciotto then claimed that if the TMT were built, her "star-knowledge practices" would be hindered.

Again, Coleman disagreed: "Native Hawaiian star knowledge was, I think, mostly confined to things that can be seen from much lower elevations. Who would want to go up to the summit of Mauna Kea to observe stars which you cannot see as well with the naked eye as you can from ocean level? At sea level, your eyes work just fine. And in old Hawai'i, there were no ground lights, so astronomy could be done from anywhere. To say the old Hawaiians went up to the summit of Mauna Kea to do astronomy, that's just not true. We have to go up to those tremendous altitudes simply because we have built lights that makes seeing from lower elevations untenable."

KaHEA, one of the TMT opponents, presented as a witness its own native Hawaiian scientist, Narissa Spies, a doctoral candidate in zoology at the University of Hawai'i who is studying diseases of coral. Spies, who declined to accept a scholarship from the THINK fund established by the TMT, said she felt the efforts of the astronomy community to engage the larger community "feel disingenuous and obligatory. It's as though they are fulfilling some kind of task in order to get something they want."

'King of the Owls'

A dispute over who has claims to Hawaiian words arose at one point, when Pua Case informed Amano that she objected to the group PUEO being referred to by the Hawaiian word pueo (owl). "Every time we say 'pueo' for Perpetuating Unique Educational Opportunities, it just – my na'au just turns over because that is a very sacred bird and it's also an aumakua for some of us." Case proposed referring to the group as P-U-E-O.

Petitioner Clarence Kukauakahi Ching added his own objections, noting his deep respect for the Hawaiian short-eared owl. He added: "And the deeper reason for my objection — and you can look it up in the Hawaiian dictionary, Pukui's dictionary — is that my name is the same name as our mythical king of the owls and the legend that goes with it. And so I seriously object to the use of that word."

(Pukui's dictionary defines it this way: "Ku-kaua-kahi. n. Said to be an old name for the gods Kane, Ku, and Lono. The theory of a trinity is believed due to remaking of Hawaiian legends by Kepelino, Kamakau,

and Fornander to conform to the Bible.")

Keahi Warfield, president and one of the founders of PUEO, addressed the hearing: "Naming practices in Hawaiian culture are very important. In creating the organization PUEO it was never my intention to call it P-U-E-O. There is a story connected to the naming of PUEO. And if any of the petitioners would have come to me and asked for two minutes of my time I would gladly give them the time to explain to them how that name came about."

Case replied, saying it was not her intention "at any time to in any way engage or insult you. ... I am also going to say that I'm kanaka maoli first, and I aloha you for your response ... the last thing that I want to have is us sitting in the same room with a misunderstanding."

Since then, Amano has referred to the group by its full name. Most of the TMT opponents have continued to call it P-U-E-O.



The Opponents' Case

Once the TMT opponents began presenting their cases, the nature of the testimony changed substantially, focusing far more on the claimed religious practices and beliefs of native Hawaiians.

Ku Kahakalau, a Hawaiian teacher, testified that the TMT's construction would constitute desecration. Hawaiians, as younger siblings to the mountain, are called on to protect it, she said. "Our definition of sacredness is very different than that of people who come from a mentality and a culture where the predominant religion is to subdue the earth, that their view of sacredness of the earth is a completely different view than my view and the Hawaiian view, which is ... that I am a direct descendant of the same deities that created the land and the mountain," she said. "I am a younger sibling to the islands and a younger sibling to the mountain, and as a younger sibling I need to take care of and love and cherish and fondle, in a most precious way, the environment, the entire environment."

Lincoln Ashida, attorney for PUEO, asked Kahakalau if she might be open to some compromise regarding the TMT construction. "There are things that I would call non-negotiables. And non-negotiables are never open to compromise," she replied. "The building of the TMT is a non-negotiable."

She went on to describe it as "another monument to Americanism, to capitalism,

to expansion, at all costs, without any care and any concern about the people that live here and our values and traditions. ... They clearly remind us that we are being colonized ... continue to be exposed to things that we feel are not ethical, that are not pono in terms of expanding scientific knowledge at the expense of our values and traditions.”

Candace Fujikane, an English professor at the University of Hawai'i-Manoa, also testified that the TMT would desecrate Mauna Kea, which she claimed was sacred from the Saddle Road to the summit.

“The land itself is a map that reminds us of the mo'olelo,” she said. And if the TMT is built, Hawaiians will lose the ability to relate the mo'olelo, or stories and legends, to that place. The bottom line, she said, was

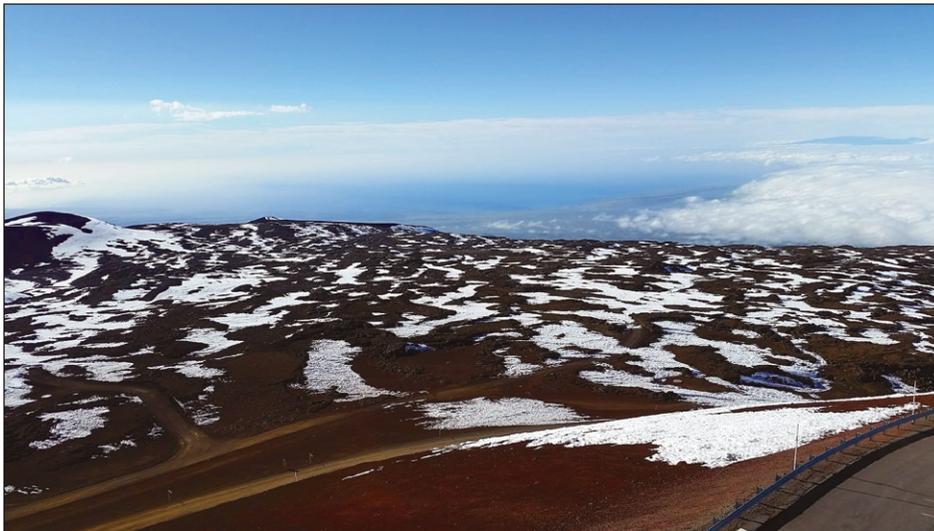


PHOTO: NIKI THOMAS

A view of the northwestern plateau below the Mauna Kea summit, including the proposed site of the TMT.

“Mauna Kea is overbuilt.”

Laulani Teale, a traditional healer presented as a witness for Deborah Ward, talked about how the TMT would affect “alignments.” “Alignments in the heavens are reflected in alignments on Earth,” she stated in her written testimony, and “these directly relate to alignments within and between human beings. Our relationships to one another, to the Earth, to pono within ourselves are all affected by natural alignments that are the product of Wakea and Papa relating to one another in the context of creation. ... Human interference with this great act of continual alignment is very harmful.”

Jon Osorio, a professor of history at the University of Hawai'i, acknowledged that he had never been to the summit of Mauna Kea, yet described it as an “industrial park.” When challenged on this, he said he was using the term in a way meant to be “rhetorical” and that with its use, he “intended to call attention to what you can actually

do to a conservation district if you ignore its basic conservation-ness.”

Osorio said he had “looked at the way in which the approvals of this project have gone forward, the disregarding of testimony and in some cases the inability of cultural practitioners and environmentalists and other people to present opposition to this project.... I believe that one of the things we are addressing here today is not just the cultural concerns of my own people but also the political processes and procedures of this state.”

David Kimo Frankel, an attorney who resigned from the Native Hawaiian Legal Corporation in December, was called to rebut testimony offered by David Callies, a law professor at the University of Hawai'i.

Among his more controversial statements, Callies, offered by TIO to testify about land use law in Hawai'i, had maintained that the public trust doctrine did not apply to state lands. Frankel spent much of his time on the stand addressing that issue.

Kehau Abad was offered by KaHEA as an expert in Hawaiian anthropology, ethnography, archaeology, historic preservation, and culture. She testified that the studies done for the TMT of Hawaiian cultural and historic sites did not extend far enough out from the proposed building site.

Abad also discussed a “ring of shrines,” stating that the TMT site needed to be considered “in that context.” Ross Shinyama, representing TIO, asked where the shrines might be found. “Within this ring of shrines area, are there any observatories currently within this ring?” Shinyama asked.

“Okay, so when you say within—I would need you to show me what you mean by within, visually show me what you mean by that term,” Abad replied.

“When you use the word ring, I’m thinking of a circle. Am I incorrect?” Shinyama said.

“If you’re imagining there’s a doughnut, that’s not the distribution,” Abad answered. “Our whole point, the point I am trying to raise, is there hasn’t been adequate enough study to really address the relationship of all of these relative to the undertaking.”

To address the botanical impacts of the TMT, KaHEA presented Eric Hansen, apparently in rebuttal to Clifford Smith, a lichenologist who testified for the University of Hawai'i. In 2011, Hansen was crew leader of a baseline survey of lichens, mosses, and other plants in the entire summit area sponsored by the Office of Mauna Kea Management. His crew found two endemic grasses and two endemic ferns as well as several indigenous plants.

Hansen acknowledged that his survey was by no means comprehensive. Pua Case asked, “Is it correct that in order to find good specimens in [the TMT area], one would need to conduct monthly collections for at least one year?”

“You can’t do it once a month for a year,” Hansen answered. “You’d need to do it every day, 365 days, to just get a baseline of what’s going on up there.” Until that is done, he opined, no further development on the summit should be undertaken.

Petitioner Harry Fergerstrom offered as one of his witnesses Williamson Chang, a law professor at the University of Hawai'i. Chang’s written testimony challenged the legitimacy of the state government and its title to the summit lands, among other things. Because Amano and the Land Board had earlier ruled that these topics would be off-limits, Amano did not allow Chang to testify.

Her decision led to an angry outburst from Fergerstrom. “You, Ms. Amano, have done a very poor job of this contested case. It has been riddled with administrative bias. ... You’ve actually made my case, this is going to go to appeal and you’re going to lose.”

Spectral Evidence

TMT opponents also put on several witnesses who gave what, since the Salem witch trials, has been called spectral evidence. Pua Case was the first of these to take the stand. Case is an educator and a kumu hula and, along with her husband, Kalani Flores, is part of the Case-Flores 'Ohana that has been admitted to the contested case. She attested to her special relationship with a mo'o wahine (female deity) called Mana'ua, who can be called upon to make rain in Waimea.

Wind Farms to Fund ‘Research Push’

Operators of Hawai'i's wind farms are poised to spend more than \$4 million on efforts to fill critical knowledge gaps regarding the endangered Hawaiian hoary bat, and may eventually spend up to \$6 million.

“We’re starting a massive research push,” said Jodi Charrier, a biologist with the U.S. Fish and Wildlife Service.

As part of mitigation required by their Habitat Conservation Plans, all of the wind farms in the state have had to commit funds to support research on the bats, which are killed by the facilities’ turbines.

The state’s Endangered Species Recovery Committee (ESRC), which includes scientists and representatives from the Fish and Wildlife Service and the state Division of Forestry and Wildlife (DOFAW), identified in 2015 its top research priorities with regard to the animal. Last September it approved a handful of projects from 17 responses to a request for proposals.

The projects will ultimately give resource managers a better picture of the bats’ diet, range, habits, and genetic distribution, among other things.

With regard to the proposed genetic

work, which may expand on recent studies suggesting that there may be two genetically distinct populations of bats, former committee member Sam Gon said at a recent meeting that the work could answer questions of how important the O’ahu populations are.

“If they’re essentially homogeneous with the rest of the archipelago, then you worry a bit less about them,” he said.

What none of the research projects directly addresses is whether or not the bat mitigation conducted so far has had any positive effect.

“Up to this point, there has not been a robust way of demonstrating that these projects have offset the take requested under the HCPs, or if the net benefit requirement has been met,” DOFAW Maui branch manager Scott Fretz told the ESRC.

Committee member Jim Jacobi expressed some hope at its meeting last December that the results of the studies to be conducted will quickly be put to use in assessing the benefits of mitigation.

“We don’t want to wait five years for that. We want to have that happen fairly quickly here because we have several projects where mitigation is doing habitat enhancement and we’re sort of guessing,” he said.

Also absent from the list of projects is any work on methods to keep bats away from wind turbines. Even so, Charrier said that work on UV lights and acoustic deterrents have shown they both have potential.

— T.D.

Hawaiian Hoary Bat Research Projects

Project and Duration	Personnel	Islands	Cost
Genetics (3 years)	Bonaccorso (USGS), Pinzari (UH)	O’ahu, Maui, Hawai’i	\$393,355
Movements, roosting behavior, and diet	Bonaccorso, Paxton (USGS) Banko	Hawai’i	\$1,831,565
Home ranges, seasonal movements, habitat utilization, diet, and prey availability (3 years)	Johnston, Duke (H.T. Harvey Associates)	Maui	\$751,378
Bat distribution, occupancy analysis, resource selection; methods for abundance estimates (2-4 years)	Derby, Thompson (WEST)	O’ahu and/or Maui	\$1,105,081
Modeling foraging habitat suitability (1 year)	Bonaccorso, Gorresen (USGS)	O’ahu	\$143,542
Total			\$4,224,921

Source:DOFAW

“Mana’ua, the pohaku, the rock, is where Mo’oinanea, the kupua of Lake Waiau, comes to when she visits Mana’ua, if you want to say, the mo’o of the rain,” she said.

Mo’oinanea appeared one day to Case’s younger daughter, Case said, and asked her daughter to appeal to Case to intervene in the contested case, to “stop the telescope.”

Diana LaRose, a self-described sensitive of Cree ancestry, described even more extensive contacts with the spirits on the summit.

Claiming that her visions were “99 percent accurate” and that physicians called on her to help in diagnoses, she described several visions she experienced on the summit of Mauna Kea.

In one instance, while sitting near the proposed TMT site, she saw a stone circle with a cylinder in the center with wedge-shaped stones radiating out. She described seeing “constellations moving across the

sky... Then the light from a particular star and particular constellation would go down in the center of this cylinder and it would be distributed out into rays.”

Hawaiian astronomers and navigators were sitting in the circle, LaRose reported, and they received “direct knowledge of the stars through the energy of the stars into those pohakus.”

“The real importance of this site is that the stars, these stars I saw, they would give specific knowledge directly to the people right through the crown of their head,” she stated.

First to question LaRose was TMT opponent Deborah Ward, who asked her to explain how to convey that experience to others so that “people can comprehend and understand confidently that it’s not superstition. I’m trying to understand how to language an intangible feeling.”

“Most people around the entire world have intuition,” LaRose replied. A lot of scientists are visionaries, she said, mention-

ing Einstein and Hawking.

Michael Lee, a witness for Fergerstrom, stirred controversy last summer by placing the bones of one of his ancestors in one of the ‘ahu built in 2015 on the road to the TMT site.

Lee’s testimony defies easy summation, but he related stories of murder, incest, and many supernatural phenomena, including a “space vagina,” female ancestors who engage in “genetic engineering” and who marry “children and grandchildren for 500 years,” shark goddesses, and a rainbow bridge linking Haleakala and Mauna Kea.

“We are headed ... to turn this planet into Mars, a dead planet,” Lee stated. “We are moving down that path. Ke akua knew we would go there so he created the Hawaiian people and the Hawaiian islands to be here when we get in this global warming to show the path to navigate the correct pono way.”

— Patricia Tummons

Bats from page 1

Kawailoa is seeking to add another tier of mitigation and at least 55 bats to its allowable take, and Auwahi has proposed changing the way bat kills are estimated so the numbers won't be so high.

But how many is too many killed or injured bats? And how much mitigation by means of forest restoration is enough to negate any negative population impacts? DOFAW Maui branch manager Scott Fretz told the state's Endangered Species Recovery Committee (ESRC) back in

“There is no valid estimate of the population and there are no tools or methods to determine it.”

— Jodi Charrier, FWS

September 2015, as it was in the midst of adopting its guidance document on how to best manage threats to the bat, that the bat take being requested by wind farms “is getting alarmingly high. There is so much we don't know about mitigation. It raises the question if we are really creating a net benefit for such high levels of take.”

According to Jodi Charrier, a biologist with the Fish and Wildlife Service, there currently are no definitive answers to those questions. Knowing whether or not the rate at which wind farms are killing bats is jeopardizing the species' population is “one of the greatest challenges to clearly connect the dots with our logic,” she told *Environment Hawai'i*. She added that her agency uses the best available science to guide its

actions with regard to the tiny, tree-dwelling animals, but admits that knowledge about them is limited.

While it's known that the bats are widely distributed on all of the main Hawaiian islands, “there is no valid estimate of the population and there are no tools or methods to determine it. It's the same for hoary bats on the mainland,” she said. Cave-dwelling bats can be counted relatively easily, while tree-dwelling bats are challenging to count and to catch, she said.

“They're a cryptic species,” she said, noting, however, that resource managers

and the wind farms have recently started a major bat research blitz. Contracts for work seeking to better assess the population and identify the bats' habitat and diet, among other things, are just now being put into place and it will be two to five years before any results are ready, she said.

In the meantime, the turbines for all of the state's wind farms keep spinning, even those for the ones that have exceeded their allowable take. Under the Endangered Species Act, a violation of the terms of an incidental take permit would result in an illegal take under section 9 of the act. However, if the violation is deemed technical or inadvertent, the FWS “may send the permittee a notice of noncompliance by certified mail or may recommend

alternative actions to the permittee so that they may regain compliance with the terms of the permit,” according to a fact sheet on the ESA posted online by the Fish and Wildlife Service. In the case of the Hawai'i wind farms, Charrier said that her agency and DOFAW are simply working with the facilities on amending their HCPs and take permits, which can take up to two years to complete.

\$50K Per Bat

The state's five active wind farms together produce as much as 171 megawatts of electricity, and the three more — Na Pua Makani on O'ahu, and Lalamilo and Pakini Nui on Hawai'i island — that are in the pipeline will have the collective ability to produce another 49.3 MW, for a total of more than 200 MW. And given the state's new goal of producing 100 percent of its electricity with renewable energy by 2045, the Hawaiian Electric Company is actively seeking developers to construct even more wind energy projects on O'ahu before federal tax credits expire.

The additional turbines, if constructed, will no doubt result in more bats being taken. So how much will these facilities have to pay to mitigate its bat takes? Under the current policy adopted by the ESRC: \$50,000 a bat, at least for the next few years.

Over the years, the existing wind facilities together have spent millions of dollars on research and on-the-ground mitigation (most often restoration activities to increase or enhance forested and foraging areas), in addition to choosing to slow their turbines when there is little wind to a speed that studies have shown significantly reduces the likelihood of harming bats. But the mitigation done so far has been inconsistent among the facilities, according to the bat guidance document.

New ecological information often leads to changes in recommended mitigation, resulting in “an unpredictable scale and cost of mitigation, making it difficult to measure the impact on species recovery across a large number of disparate projects,” it states. It goes on to note that in the HCPs for the five wind farms and the three in development, restoration efforts ranged from 13 acres to 40 acres per bat, and costs ranged from \$10,000 to \$87,000 per bat. “One HCP mitigated by providing funding for research at a cost of \$1,000 per bat,” the document states.

That may no longer be the case now that the ESRC, in adopting its guidance document, has endorsed a rate of \$50,000 per bat when calculating mitigation costs, at



PHOTO: AUWAHI WIND POWER

The Auwahi wind farm on Maui.

least until the guidance document is revised again. On average, the amount spent on bat mitigation had averaged nearly \$50,000 per bat, but the committee also took into account estimated watershed restoration costs of the state's Rain Follows the Forest Initiative (between \$35,708 and \$68,415 to restore 40 acres) and costs associated with managing the state's forest reserves, Natural Area Reserves and wetlands for which restoration costs can run anywhere from \$40,000 to more than \$80,000 per 40-acre tract — assuming 40 acres per bat for forest projects.

The cost-per-animal standard its only meant to be temporary, however. The ESRC plans to revise its bat guidance document every five years. And as new information is gathered that can help refine mitigation efforts, that standard may change.

"It's the actual biological return that counts. ... The dollar [per animal standard] is just an arbitrary thing," said ESRC member Jim Jacobi at the committee's meeting last December.

Helemano Acquisition

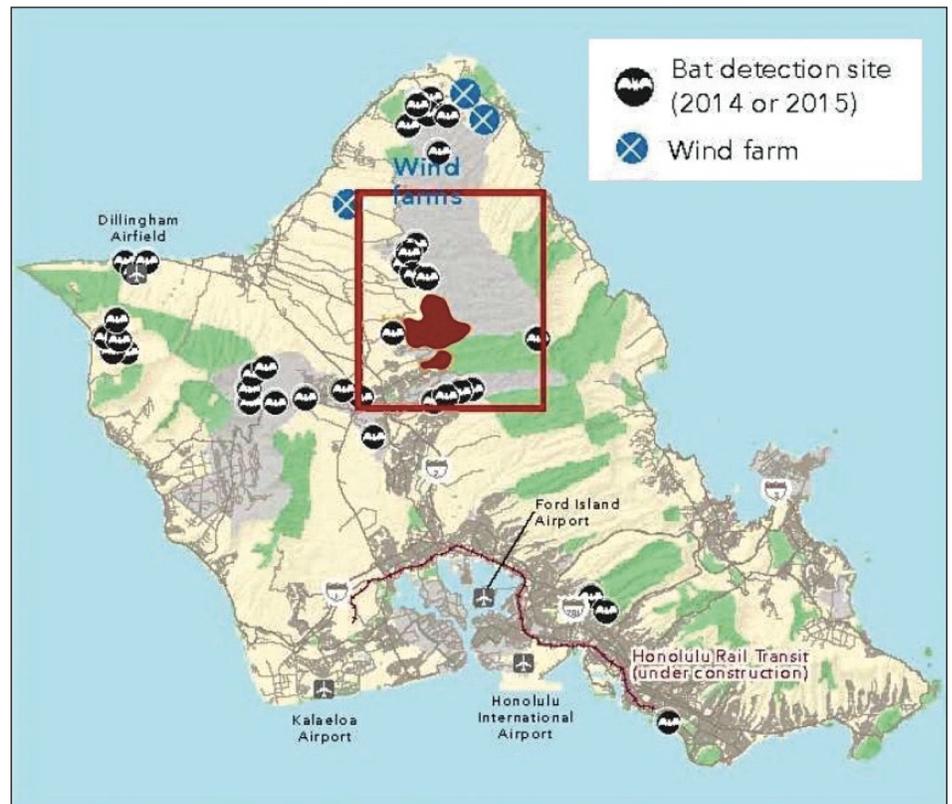
For now, the requirement that wind farms pay \$50,000 for every bat that is anticipated to be taken may assist in the state's years-long effort to obtain four parcels totaling roughly 3,000 acres at Helemano, O'ahu owned by Dole Food Company. Kawaioloa Wind Power in December briefed the ESRC on its proposal to contribute \$2.75 million toward the purchase of the lands by the state. Last year, the Board of Land and Natural Resources agreed to use \$1.5 million in Legacy Land Conservation Program funds to help with the purchase.

"It's the actual biological return that counts."

— Jim Jacobi, USGS

The total purchase price is expected to be around \$15 million, and the state Department of Land and Natural Resources, the U.S. Department of Defense, the U.S. Department of Agriculture, the City and County of Honolulu, and the Fish and Wildlife Service have all either committed or expressed interest in contributing funds. The proposed contribution from Kawaioloa would all but seal the deal.

The Kawaioloa facility is by far the largest wind farm in the state, with 30 turbines and the capacity to generate nearly 70 MW of electricity. In addition, it has probably taken the most bats. Currently, the HCP and ITP for the facility allow for the take of up to 60 bats over the 20-year life of the



MAP: KAWAILOA WIND POWER

A map indicating the proposed Helemano Wilderness Area and the locations of wind farms and recent bat detections.

project, and it has already been estimated to have taken up to 54 in its first few years of operation. The company now seeks to amend its HCP to allow take of at least an additional 55 bats. At \$50,000 for each additional bat to be taken under the new HCP (if approved), that works out to \$2.75 million.

At the ESRC's December meeting, DOFAW O'ahu branch manager Marigold

"If bats like a certain type of tree with certain spacing, we could plant that," she said. "It really has a lot of possibilities as far as using the latest research of what bats need."

She noted that under a sales agreement with Dole, the state had six months to secure the money to buy the lands. "The funds [from Kawaioloa] would provide a critical source of funding to close the project," she said, adding that she doubted whether the state could buy only some of the parcels if the Kawaioloa money wasn't available to help buy all four.

While some committee members expressed concern over the other potential competing uses of the property — recreation, timber harvesting, etc. — a representative from the Fish and Wildlife Service noted that it has contributed \$2 million toward the acquisition and feels that the benefits to the bats outweigh any potential negative impacts.

Although the committee was not slated to vote on whether the land acquisition was an acceptable new mitigation measure for the HCP, Kawaioloa representatives said the company needed some idea of the committee's leanings because it was planning to commit the funds very soon.

Committee member Jacobi said he supported the concept of the acquisition,

Zoll explained that the acquisition of the Helemano lands would secure the state's access to its Poamoho ridge trail and 'Ewa forest reserve, where there is great potential for public recreation, silviculture, and intense forest management. Sale of the lands to a third party would terminate the state's access and also hamper bat take mitigation efforts in the area, she said.

She noted that bats have been detected in all of the lands surrounding the Dole properties and likely occur on Dole lands, as well. One of the parcels, which is zoned for agriculture, could be farmed for native plant production and timber products and be managed so that it serves the bat's habitat needs for its various life stages, she said.

but “we don’t have a good formula yet on how to produce more bats with a certain kind of management action. If we were at that point, we would probably have some concerns in terms of if we really could ramp this up as a good bat production zone, its potential impacts with the Kawaihoa wind farm and ones in that general area.”

The Hawaiian hoary bat has been found to travel as many as 12 miles in one night, and Jacobi suggested that he and some of his colleagues at the U.S. Geological Survey are concerned that mitigation areas may not

In the case of the Auwahi wind farm, the model has found that there is an 80 percent chance that the turbines have killed as many as 23 bats as of last June. The farm’s current take limit is 19. Had the FWS been willing to accept a confidence level of 50 percent, the estimated take would have been lower, and Auwahi has suggested that that level should be acceptable for annual bat take estimates.

“The basis for 80 percent, the statistical rationale, hasn’t really ever been explained to us,” Auwahi biologist Marie VanZandt

One FWS staffer who did understand Snetsinger’s proposal noted that if a median confidence value is used, “50 percent of the time, you’ll be under-mitigating, 50 percent of the time you’ll be over-mitigating.”

“That seems like the opposite of confidence. That’s no confidence,” DOFAW’s Fretz said.

DOFAW’s Kate Cullison conceded in written comments on the proposal that by “spreading mitigation based on the 50 percent credibility level across multiple projects, the law of probability suggests that you will be close to the actual need or target. While this is a sound and well-documented approach for aggregated systems, it differs from the present situation in Hawai’i.”

First, there is no aggregated system of wind farms in Hawai’i. Each facility has its own unique HCP. Second, she stated, the “50 percent” approach assumes that a bat taken at one facility is equivalent to one taken at another. “Thus, if take is underestimated and subsequently under-mitigated for at one site, the deficit will likely be made up by mitigation at another site,” she wrote, adding that this may not be the case in Hawai’i, where preliminary studies suggest there are two genetically distinct groups of bats in Hawai’i.

The committee ultimately recommended that Auwahi representatives work with FWS and DOFAW staff on preparing a one-page explanation, with examples of how the new standard would be applied, for its next meeting.

“I fully support the concept of exploring new territory. If we’re going to change to something, let’s have a logical reason to change. ... I would not like to see this drag out over the next six months,” Jacobi said.

“If bats like a certain type of tree with certain spacing, we could plant that.”

— Marigold Zoll, DOFAW

be far enough away from the wind farms to be fully effective.

“We would really urge as we learn more about bats and how to manage for them and produce them ... that we come up with a strategy on how to determine where to do those best relative to other current or proposed areas where they may run into that kind of interaction. It’s not an issue now, but is something we need to consider as we move along the bat track,” he said.

The committee as a whole expressed its general support of the acquisition. The FWS’s Charrier later told *Environment Hawai’i* that Kawaihoa was still committed to funding the project, but was awaiting the issuance of a support letter from her agency, which she indicated was forthcoming.

Alternate Accounting

At the same December ESRC meeting where Kawaihoa presented its proposal, representatives of the Auwahi wind farm briefed the committee on its suggestion about changing the way the computer model used to estimate potential bat takes is applied so that the numbers aren’t so high.

The model, developed by the FWS and applied only in the past few years, takes into account the observed bat take, as well as the many variables that can influence whether or not a search team finds observable evidence of a bat take: the terrain surrounding the turbines, the amount of time a bat carcass is likely to persist in the environment, the efficacy of the search effort, etc. The model produces a range of potential bat take scenarios and assigns a confidence level to each one. Erring on the side of caution, the USFWS and DOFAW have advised the wind farm to select the bat take scenario that has a confidence level of 80 percent.

told the committee. Her company has been in the process of amending its HCP and ITP for the past two years because of its higher-than-expected bat take estimates. “We want to provide confidence that our take limit isn’t going to be exceeded. We want to ensure we don’t have to go through a second amendment.”

She added that she had an obligation to not overestimate the wind farm’s bat take and thereby misrepresent to the public the facility’s impacts.

Tom Snetsinger of Tetra Tech, a consultant to Auwahi, pointed out two ways in which the FWS may be overestimating the number of bats taken: 1) the model is unable to factor in the effect that curtailing turbine speed during low-wind (which most of the Hawai’i wind farms are now doing) has on the number of bats taken; and 2) a recent study suggests that models may be underestimating how long bat carcasses

“That seems like the opposite of confidence. That’s no confidence.”

— Scott Fretz, DOFAW

persist in the environment and thereby are overestimating the level of unobserved take. With regard to the confidence standards set by the FWS and DOFAW, he explained that the company still planned to use the 80 percent credibility level to determine the upper limit of take overall, but in terms of monitoring annual takes, it wanted to use a “central tendency” or median value that it believed better reflected actual take.

His explanation of why using a median — or 50 percent — value was the best way to measure compliance with the ITP seemed difficult for some committee members and agency staff members to grasp.

While the committee has not yet reconvened to discuss the matter further, Charrier told *Environment Hawai’i* that her agency and DOFAW, at least, still believe the 80 percent standard is appropriate.

As Cullison wrote, “The core difference between the outputs at 50 percent and 80 percent is due to uncertainty. If the wildlife agencies were to use the 50 percent as the estimated take rather than the current standard of 80 percent, and the actual take was above the 50 percent output, then the result is largely manifested as a delay, which will result in a deficit in lost productivity that may not be regained.” — *Teresa Dawson*

East Maui Stream Flow Case Reopens; Parties Debate Standards of Evidence

Having been pushed back a month from its previously scheduled time, the re-opened contested case hearing on amendments to the interim instream flow standards (IIFS) of some two dozen East Maui streams begins on February 6 at Maui Community College and is expected to conclude on the 10th.

The Commission on Water Resource Management decided last year to reopen the hearing after Alexander & Baldwin, Inc., announced it was closing its subsidiary Hawaiian Commercial & Sugar's sugarcane plantation in December and transitioning those former cane fields to diversified agriculture.

HC&S later submitted to the commission a diversified agriculture plan — with an accompanying chart — that includes cattle ranching and dairy operations, bioenergy crops, an agricultural park, small diversified farms, and beverage orchards, among other things. Total estimated surface water needs, it claimed, amount to some 116 million gallons a day, which is tens of millions of gallons a day less than what it used for sugarcane.

The nonprofit Maui Tomorrow Foundation (MTF) and native Hawaiian East Maui residents represented by the Native Hawaiian Legal Corporation (NHLC) — all parties to the case — have argued that the chart and the company's unsubstantiated calculation of water requirements for each proposed crop or use are insufficient bases for a commission decision on the IIFS, especially in light of the fact that a much higher evidentiary standard was applied to instream uses during the contested case hearing last year. Both entities suggest HC&S's claimed per-acre water needs for diversified agriculture would result in an over-allocation that would far exceed actual need, and thereby violate the public trust doctrine.

In case filings submitted last month, NHLC attorneys Summer Sylva and Camille Kalama also pointed out that EMI's system diverts water from more than 40 streams, while the IIFS case deals with only two dozen of them. The streams not included in the contested case, as well as A&B's groundwater well in Central Maui, are all alternative sources of water that the companies could use before seeking to tap the streams that the NHLC's clients rely on, the attorneys argued.

In its response, attorney David Schulmeister, representing HC&S, argued that the evidentiary standards MTF and NHLC sought to apply to the company's proposed water uses were unnecessarily high, and "so stringent that it would undermine, rather than support, the obvious public interest in facilitating the transition of HC&S former sugar lands into continued agricultural use."

"Water needs for offstream uses like the Diversified Agricultural Plan should not have to be proven with specificity of a degree that is unattainable absent significant investment in such uses, which businesses would be deterred from making given the exorbitant cost and delay associated with petitioning CWRM to amend the IIFS downward if the amended IIFS set in this proceeding do not account for A&B's proposed offstream uses," he wrote.

To show HC&S's commitment to the plan, Schulmeister noted that the company was working this year toward an agreement with the Maui Cattle Co. to turn 4,000 acres of former sugar lands into pasture and had already begun fencing off areas, seeding them, and installing irrigation. Also this year, he continued, it planned to sell about 850 acres to the county for an agricultural park, establish 100 acres of oilseed orchards, and make other lands eligible for any utility request for proposal for renewable energy development, among other things.

Holdover Diversions

No one knows how long it will take hearing officer Lawrence Miike to issue his revised IIFS recommendations once the hearings this month conclude or how long it will take the Water Commission to act on them. In the meantime, HC&S is continuing to divert water from East Maui under a holdover, approved last December, of four expired/invalidated revocable permits issued by the state Board of Land and Natural Resources. In approving the holdover, the Land Board prohibited any waste or non-beneficial use of the water, but did not indicate how that would be monitored or enforced.

Sylva stated in an email, "Enforcement and implementation of the conditions to which these four judicially invalidated revocable permits are now subject are a real

concern. But equally, if not more, troubling is how the Land Board continues to treat as 'valid' permits that the First Circuit Court 'invalidated' back in January [2016], or how it reasons that another one-year holdover of A&B's uninterrupted use of unknown quantities of water from 33,000 acres of public trust ceded land without ever completing an EIS is consistent with the public trust doctrine."

Land Board member Chris Yuen had pointed out that with the closure of HC&S, many of the most important streams for taro farming had been mostly, if not fully, restored, suggesting that should be good enough — for now — for East Maui residents. He added that, because so much of HC&S's lands were state-designated Important Agricultural Lands (IAL), they should be provided an ample source of water. Sylva, however, saw the board's decision as a lost opportunity to reverse the century-long status quo from diverted to undiverted streams.

"A&B has no immediate need and no concrete plan for surface water originating from East Maui," she wrote. "Instead of making the most of this unprecedented turn of events in service of the public interest (e.g., stream science and biota research, bona fide watershed management, the execution of lawful permits/leases, comprehensive environmental reviews, etc.), the Land Board has conferred a facade of legitimacy to a permitting process that has been anything but."

As for Yuen's statement that water serving IAL should have some kind of constitutional protection, Sylva continued, "This concept has no basis in our law for a number of good reasons. First, it would allow streams to be drained even though ground water or alternative sources of water could/should be used to irrigate commercial agricultural lands. It would also unfairly elevate the interests of large, commercial landowners over and above everyone else's by declaring certain of their lands 'important' — a designation that already allows these powerful, moneyed interests to take advantage of a number of significant incentives and protections (e.g., grant assistance, tax incentives, reduced infrastructure requirements, state funding, etc.). These kinds of commercial ventures are not deserving of constitutional protection.

"The law requires our Land Board to be objective, proactive trustees who consider, protect, and advance public rights in the resource. That wasn't done here."

— T.D.

BOOK REVIEW

Parting the Curtain on Whales And Dolphins in Hawaiian Waters

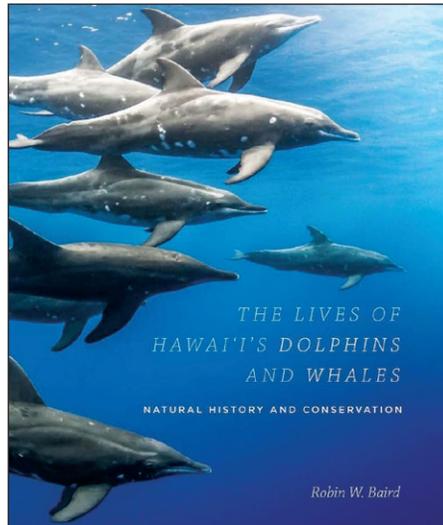
Robin W. Baird. *The Lives of Hawai'i's Dolphins and Whales: Natural History and Conservation*. University of Hawai'i Press, 2016. 342 pages (including bibliography and index).

Less than two decades ago, knowledge of land and research into Hawai'i's cetaceans was pretty much limited to just two of the more common species. And then Robin Baird began his work in the islands.

"When I started working in Hawai'i in 1999, there was a crowded research environment," Baird writes in the preface to *The Lives of Hawai'i's Dolphins and Whales*, "but with one or two exceptions, every publication on whales and dolphins in Hawaiian waters in the previous thirty years had focused on just two species: humpback whales or spinner dolphins."

It made no sense to him, he continues, "to focus on those well-studied species, and when opportunities arose to work with any of the rarer, lesser-known species, I took them." Since then, he has made hundreds of marine surveys, criss-crossing thousands of miles of ocean around the main Hawaiian islands, in an effort to document both the resident populations of whales and dolphins and the species that merely pass through these waters. Those that reside here, Baird writes, find the islands to be an "oasis in a desert sea," thanks to the complex ocean currents and other phenomena that combine to bring nutrient-rich waters from the deep ocean closer to the surface. "It is not the productivity itself around the islands that creates the oasis; it is the discontinuity between the extremely low productivity waters of the central tropical Pacific and the slightly more productive waters immediately surrounding the islands that creates it," he writes.

"Of the twenty-five species of whales and dolphins that have been recorded in Hawaiian waters, more than half (eighteen) of the species are odontocetes – the toothed whales and dolphins. The remaining seven species are mysticetes – the baleen whales. Most of the baleen whales come to Hawaiian waters only in the winter, and some of the odontocetes just move through the area, part of large open-ocean populations. But for eleven of the species, all of them odontocetes, this oasis has created a year-round home, with populations living off the island



shores, taking advantage of the increased predictability of prey."

All 25 species (and a few more baleen whales that are rare visitors) are described in Baird's book, but he gives disproportionate attention to five species of oceanic dolphins collectively known as "the blackfish." His presentation of species starts with this group, he writes, "both because they are my favorite group and because the best-known populations of several of these species anywhere in the world are found in Hawai'i." (By now, it should go without saying that the reason these several species are the world's "the best-known populations" rests firmly on Baird's own shoulders.)

Many of the astonishing results of his having taken this less-traveled research road are evidenced in this recent volume.

It is, perhaps first and foremost, a reference book. More than 20 species of whales and dolphins are described and illustrated in sections organized around general types: oceanic dolphins, beaked whales, sperm whales, and baleen whales. Meticulously documented, it is as scientifically rigorous as any peer-reviewed publication, yet it is written in a style that is accessible to the layperson.

It is a story book. The interactions of these highly intelligent, social animals not only among themselves but also with hu-

mans and other species, make for fascinating narratives.

On top of all that, the book's large format – 10 inches by 8 ½ inches – and stunning full-color photographs make it suitable to display on any coffee table.

Societies of Friends

Several of the more endearing social behaviors of false killer whales have been widely described well before this book was published. But in this volume, they're documented as to date, location, and parties involved. One of the best known encounters involves inter-species prey-sharing and took place in 1984, when Dan McSweeney, a researcher who has worked closely with Baird, was following a group of false killer whales off the Kona Coast.

As Baird recounts, McSweeney "slipped into the water with a mask, a small scuba tank, and an underwater camera. Two black shapes moved by below, vocalizing. Dan turned, and a third individual was swimming rapidly toward him, carrying most of a large ahi, a yellowfin tuna, weighing over 45 kilograms The whale stopped a couple of meters away and opened its mouth, letting the fish go, and the momentum carried the fish toward Dan. The whale was obviously offering the fish to him, and Dan reached out and took it. The false killer whale started blowing bubbles, moved away, then turned rapidly and came back, stopping next to him again. Dan pushed the fish back toward the whale; it took it slowly and deliberately, then moved away and joined its companions. The whales passed the fish back and forth and started to consume it, and all had a share."

This type of behavior, says Baird, "probably serves to reinforce the strong bonds among individuals that may be constant and long-term hunting companions in an environment where the benefits of cooperatively finding and catching prey allow them to survive as top predators."

The false killer whales and other species of blackfish have "enduring bonds among individuals," he writes. Females begin to give birth to their first calves somewhere around nine years of age and continue to calve every couple of years until their mid-40s, when they go through menopause, "unusual in the animal kingdom," Baird writes, and probably evolved "because older females perform a more important role as a grandmother or auntie than they would by having more calves themselves."

The population of false killer whales in the waters around the Main Hawaiian Islands is low enough – around 120 indi-

viduals – and threatened enough, to have been listed as endangered in 2012, largely thanks to Baird’s work. For this, he has not been thanked by the Western Pacific Fishery Management Council and the commercial fishermen it represents. As a result of the listing, additional restrictions have been placed on longline vessels fishing in waters around Hawai'i. Baird is frequently vilified in comments made during council discussions of protected species management measures. In 2013, he was named to the council’s Protected Species Advisory Committee but after a rancorous meeting in January 2014, when Baird and others say he was treated in a highly uncivil manner, he resigned. (For more on this, see the May 2014 edition of *Environment Hawai'i*.)

In contrast to false killer whales, short-finned pilot whales are probably the most abundant blackfish residing around the main Hawaiian islands. Baird notes that estimates of their population range between 19,000 and 20,000 individuals, with the highest concentration off Hawai'i Island. They also live in distinct communities. These whales dive deep for their prey, up to 1,000 meters, so prey-sharing hasn't been documented.

Yet they obviously have strong social ties. One of the most touching photos in the book is of a trio of pilot whales — an adult male and two adult females, most likely a mother and daughter — seeming to grieve the death of a calf carried in the mouth of the male.

Pygmy killer whales are the least common of the blackfish sighted in Hawaiian waters. Estimates of their numbers range from roughly 1,000 (a National Marine Fisheries Service survey in 2002) to more than 10,000 (a 2010 NMFS survey).

As Baird describes the species, it seems particularly ill tempered, attacking other species of dolphins and even having dangerous encounters — whether playful or otherwise can't be known — with humans. Their social groups are generally small, with an average size of nine individuals, he writes, adding, “From analyses of associations, pygmy killer whales have extremely strong and enduring social bonds. Two adult females first seen together in 1994 were still together twenty years later, and in almost every sighting of either individual in the intervening years, both were present.”

Pygmy killer whales are also subject to mass strandings, especially, in Hawai'i, around the Ma'alaea area of Maui. “There are probably many reasons why such strandings occur,” Baird says. “With such strong



PHOTO: ROBIN W. BAIRD

A trio of melon-headed whales.

social bonds, if one individual in a group is sick, all members of the group might move into shallow water to support it during its last days, placing themselves at risk.”

Melon-headed Whales

Baird opens his chapter on this group of whales by recounting an event witnessed by Charles Wilkes in 1841. Wilkes, commander of the U.S. Exploring Expedition, described “the chase of blackfish.” A shoal of them had been seen on a February afternoon in Hilo Bay, upon which “the natives who were fishing, and those on shore, put off in their canoes to get seaward of them; when this was effected, they began making a great noise, to drive the fish in; and finally succeeded in forcing many of them into shoal water, from whence they were dragged on

the beach, when about twenty of large size were taken.” The whales “offered a fine feast ... besides yielding plenty of oil.”

Wilkes measured one of the animals, which was later determined to be one of just four type specimens of melon-headed whales.

More than a century and a half later, in July 2004, a group of 150 to 200 melon-headed whales moved into the shallows of Hanalei Bay. “The reaction of local residents was quite different than in 1841,” Baird notes. The next morning, “community members, volunteers, the local stranding network, and others helped herd the whales out of the bay, where they had spent over 28 hours. Only one melon-headed whale, a calf, was found dead the next day.”

That “pre-stranding” behavior, he



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writes, was probably the result of a different “great noise” – generated by naval vessels to the north using mid-frequency active sonar (MFA sonar) as part of the RIMPAC military exercises.

Baird has identified two populations of melon-headed whales. The Kohala population ranges in a narrowly prescribed area from the northern tip of the Big Island down to Kona, in waters between 300 and 1,000 meters deep. By contrast, individuals from the Hawaiian Islands population “spend almost all their time in depths greater than 1,000 meters, regularly move among islands and into offshore waters, and at least occasionally move to international waters.” The estimated sizes of the two populations are 400 to 500 for the Kohala group and more than 8,000 for the Hawaiian Islands group, Baird says.

At times, “the entire Kohala resident population may be together in one large group,” he writes. “Given the frequency of naval training operations in Hawai'i, it is not hard to imagine a scenario where all or most of the Kohala resident population could be exposed to high-intensity sonar and

either be forced out of its normal range into unfamiliar waters or even end up stranding while trying to get away from the sonar. Until and unless the high-intensity sonars are prohibited in the area surrounding the range of this population off the northwest coast of the island of Hawai'i, I think they will always be at risk of a catastrophic event potentially affecting the entire population.”

Baird closes his discussion of this species by mentioning yet another source of harm. “Individuals from both the Hawaiian Islands population and the Kohala resident population have dorsal fin injuries suggestive of line entanglements. ... Whether they are sometimes taking bait off fishermen's lines is unknown, but that is one potential source of such injuries. There are also five melon-headed whales that we have photos of that appear to have bullet wounds in the dorsal fins. I suspect that melon-headed whales may have been occasionally targeted as a result of their resemblance to false killer whales, and fishermen have mistakenly shot at them, thinking they were taking their catch. It is ironic, given that melon-headed whales feed only on small squid and deep water fish and

do most of their feeding at night.”

'Lessons Learned'

Unlike many researchers and scientists, Baird doesn't shy away from making strong recommendations for the conservation of the full range of animals he describes in this book. His discussion of the conservation of false killer whales in Hawai'i, near the end, describes the long process of winning protection for their populations in the islands – a process involving, first and foremost, painstaking research, peer-reviews publications, court action, and finally, federal regulation.

“While science, both environmental and social, is critical for understanding the implications of the conflicts between fishermen and whales and dolphins in Hawaiian waters,” he writes, “mitigating these conflicts will require a long-term approach. Working with fishermen to find solutions will be the key, and educating and inspiring new generations of fishermen to accept the role of dolphins and whales in the ocean ecosystem is essential.” — *P.T.*



Short-finned pilot whales spy-hopping in the waters off of Guam.

PHOTO: ADAM Ū. COLLECTED UNDER NMFS PERMIT 15240