Phillips, Reese <reese_phillips@fws.gov>

Lehua research and initial comments

2 messages

Grange, Gabrielle Fenix <Gabrielle.Grange@doh.hawaii.gov> Wed, Jun 14, 2017 at 12:05 PM
To: "reese_phillips@fws.gov" <reese_phillips@fws.gov>, "Chee, Patrick C" <patrick.c.chee@hawaii.gov>
Cc: "Abrams, Mary" <mary_abrams@fws.gov>, "Matsuda, Thomas K" <Thomas.K.Matsuda@hawaii.gov>

Aloha Reese and Patrick,

Thanks for the brief conversations today. As I mentioned, I am doing a quick toxicology analysis of the proposed Lehua rat eradication project. As a key resource document for my inquiry, I reviewed the DEAs (DLNR and USFWS) and have the following comments on the project overall. As the deadline for providing comment on the EA has passed, it is not necessary to include responses to items in the EA, though some items raised below may be useful to strengthen the technical aspects of the documents. I request a response to my comments to assist my evaluation and agency recommendations for the project. Suggestions below may be incorporated into sampling plans, field operation plans, etc or other documents as appropriate. I have included citations and excerpts from a couple of key papers below.

Here are my informal comments:

Differentiate hazards and field work planning by rodenticide. Much of discussion of anticoagulant applications appears to refer to both diphacinone and brodifacoum, however, there are significant differences in both toxicity, fate and transport and Hawaii-specific monitoring that are not clearly delineated in the document. For example, evidence of pre-treatment brodifacoum residues in soils avian and fish tissues in studies at Palmyra and Wake and elsewhere suggest that this rodenticide can have long environmental residence times. This may also play out in the marine sediments and fish at Lehua.

Off-target impacts to marine environment. Document consistently downplays amount of either product that may end up in the marine environment. Please provide an estimate in pounds per event for each rodenticide. In the absence other information, use the Palmyra estimates of 14-19%. Of particular concern is the aerial application along the cliffs where gravity and wind may result in the highest direct to water deliveries, which present the most likely pathway for direct fish intoxication.

Expand the application and post application monitoring to specifically address pellet distribution in nearshore areas, and develop BMPs and contingency plans to adjust in the event of greater than expected application to nearshore waters, and monitoring and response to evidence of fish kills or other adverse effects. Due to longer soil, sediment and tissue persistence of brodificoum, as well as the potential for secondary exposures, longer term monitoring may be warranted. Recommend getting DOH input on the brodificoum monitoring plan prior to implementation in 2018.

Consider expanding best management practices to better explain how the applicator & field team observers will make decisions to adjust practices to minimize off target impacts. This might include assessing wind direction as well as speed. For example, would 20+ mph offshore winds along the cliffs affect the placement of pellets? Similarly, what steps would be taken if the observers on the ground or the water see large amounts of product hitting the water or a large amount of fish activity reacting to the bait?

Off-target primary and secondary effects to fish While the application and post application monitoring of diphacinone in earlier deployments at Lehua and Mokapu did not show detections of the rodenticide in environmental media, we do not have similar evidence for brodifacoum. Because brodifacoum has been documented in fish kills and fish tissue associated with island applications and has the potential for a long tissue residence time, it is reasonable to assume that there is potential for exposure. The EA's conclusion as it currently reads identifies no primary or secondary risk to local reef fish or shellfish is not adequately supported Suggest that this be modified given the uncertainty.

The earlier inert bait study indicated 19 Hawaiian species ate the inert bait, while most all rejected the diphacinone bait. The only data I could find on palatability of brodifacoum bait what from a similar informal aquarium investigation in New Zealand which suggested that 3 species tested there rejected the brodifacoum bait. There remains uncertainty about how the broad range of local reef species here will react. With a permit from DOA, partners may also want to consider conducting aquarium tests to test response, eating behavior and uptake of brodifacoum bait by local fish. I understand from our discussion that the same inert bait that was tested here in Hawaii is to be used with brodifacoum. Clarifying that in the in the EA may help the reader.

Human exposures from fishing or collecting opihi or other shellfish due to capture of intoxicated biota in the nearshore waters. Reviewing the literature, detections of brodifacoum in game fish associated with local applications is a potential human health concern. Given the uncertainty, expanding the notification and fishing restrictions to extend throughout the application periods and for a minimum period of at least 30 days after brodifacoum use or until fish tissue and sediment data demonstrate no hazard.

Please feel free to call me if you have questions or would like to discuss further. As I am new to this project, I recognize that you may have additional information I didn't see or consider in my analysis. I am happy to provide assistance throughout the project, as needed.

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HAWAII STATE DEPARTMENT OF HEALTH

From: Grange, Gabrielle Fenix
Sent: Tuesday, June 13, 2017 11:09 AM
To: Grange, Gabrielle Fenix <Gabrielle.Grange@doh.hawaii.gov>
Subject: Lehua research and intial comments

Better description of secondary consumption hazards for humans

Better estimate of non-target percentage and bmps for bucket deflectors and visual monitoring - cite article below or others.

Testing of bait material used with brodifacoum for dissolution - attractiveness to fish

Conservation Evidence (2011) 8, 100-106 www.ConservationEvidence.com

Approved monitoring plan to assess in food fish and sediments - unlikely to be detectable in water

Fishing restrictions - Where shellfish harvesting is a concern for proposed eradications, stipulating a no-harvest period linked to post-application monitoring is a prudent approach to confirming that there is no potential secondary human exposure as a result of consuming shellfish.

1. **Residue profiles of brodifacoum in coastal marine species following an island rodent eradication**

http://dx.doi.org/10.1016/j.ecoenv.2014.11.013 New Zealand study

We report a case study of monitoring selected marine species following aerial application of brodifacoum bait in August 2011 to eradicate Norway rats (*Rattus norvegicus*) from Ulva Island, New Zealand. **Residual concentrations of brodifacoum were detected in 3 of 10 species of coastal fish or shellfish sampled 43–176 d after bait application commenced. Residual brodifacoum concentrations were found in liver, but not muscle tissue, of 2 of 24 samples of blue cod (0.026 and 0.092 μg/g; *Parapercis colias*) captured live then euthanized for tissue sampling. Residual brodifacoum concentrations were also found in whole-body samples of 4 of 24 mussels (range=0.001–0.022 μg/g, *n*=4; *Mytilus edulis*) and 4 of 24 limpets (range=0.001–0.016 μg/g, *n*=4; *Cellana ornata*).** Measured residue concentrations in all three species were assessed as unlikely to have eventually caused mortality of the sampled individuals. We also conducted a literature review and determined that in eleven previous accounts of residue examination of coastal marine species following aerial applications of brodifacoum bait, including our results from Ulva Island, the overall rate of residue detection was 5.6% for marine invertebrates (11 of 196 samples tested) and 3.1% for fish (2 of 65 samples tested). Furthermore, our results from Ulva Island are the first known detection of brodifacoum residue in fish liver following an aerial application of brodifacoum bait. Although our findings confirm the potential for coastal marine wildlife to be exposed to brodifacoum following island rodent eradications using aerial bait application, the risk of mortality to exposed individual fish or shellfish appears very low. There is also a very low risk of adverse effects on humans that consume fish or shellfish containing residual concentrations in the ranges reported here. Furthermore, any brodifacoum residues that occur in marine wildlife decline to below detectable concentrations over a period of weeks. **Thus potential human exposure to brodifacoum through consumption of marine wildlife containing residual brodifacoum could be minimized by defining 'no take' periods for harvest following bait application and regular monitoring to confirm the absence of detectable residues in relevant marine wildlife.**

2. Palmyra - http://dx.doi.org/10.1016/j.biocon.2015.01.008 0006-3207/Published by Elsevier Ltd.

Special Issue Article: **Tropical rat eradication Non-target species mortality and the measurement of brodifacoum rodenticide residues after a rat (Rattus rattus) eradication on Palmyra Atoll, tropical Pacific**
William C. Pitt a,⇑ Are R. Berentsen b , Aaron B. Shiels a , Steven F. Volker b John D. Eisemann b , Alexander S. Wegmann c Gregg R. Howald d aUSDA APHIS, Wildlife Services, National Wildlife Research Center, Hawaii Field Station, Hilo, HI 96720, United States bUSDA APHIS, Wildlife Services, National Wildlife Research Center, 4101 LaPorte Avenue, Fort Collins, CO 80521, United States c Island Conservation – Hawaii

Program Office, Pacific Reefs National Wildlife Refuge Complex, 300 Ala Moana Blvd. Rm 5-231, Honolulu, HI 96850, United States d Island Conservation, 400-163 West Hastings Street, Vancouver, BC V6B 1H5, Canada

Some bait (14–19% of the target application rate) entered the marine environment to distances 7 m from the shore. Based on the Environmental Impact Statement (EIS), we expected that some bird death would result from the planned brodifacoum application to Palmyra. However, the EIS did not predict mullet or land crab mortality (USFWS, 2011). Although dead land crabs were found to contain brodifacoum residues, a study on a similar species showed that brodifacoum is not toxic to land crabs under similar conditions (Pain et al., 2000). Brodifacoum residues detected in fish confirmed that the rodenticide moved into the marine system, probably via bait drift off the flight line due to windy conditions, and such exposure needs to be considered and evaluated in future operations. *Bait drift density in the marine environment was variable from 0.0 kg/ha to 46.3 kg/ha (mean = 17.1 kg/ha) (Engeman et al., 2013)*, and was directly available to a wide variety of marine organisms. All 21 groups of dead mullet that we collected contained detectable brodifacoum residues. Mullet range widely in the Palmyra lagoon environment and are fed upon by a wide variety of predatory fish (e.g., bluefin trevally (Caranx melampygus) and giant trevally (C. ignobilis), blacktip reef sharks (Carcharhinus melanopterus), and barracuda (Sphyraena barracuda)), and potentially seabirds, such as brown noddies (Anous stolidus) (Ashmole, 1967; Vidal-Martinez et al., 2012; J. McLaughlin unpubl. data). *Therefore, having all sampled mullet contaminated with brodifacoum, and their status as a common prey item, reveals the high probability that such a terrestrial operation of attempted rat eradication can have bottom up effects in tropical marine food webs (Ebbert and Burek-Huntington, 2010). Thus, the exposure risk to other marine organisms and indirect effects to birds should be considered in future applications. In addition, accumulation of residues in reef fish and potentially predatory fish could pose an exposure risk to fishermen in waters near eradication projects*

3. **Environmental monitoring for brodifacoum residues after aerial application of baits for rodent eradication** P. Fisher1 R. Griffiths2 C. Speedy3 , and K. Broome4 1 Landcare Research, PO Box 40, Lincoln 7640, New Zealand. 2 Department of Conservation, Auckland, New Zealand .3 Wildlife Management Associates, PO Box 308, Turangi, New Zealand. 4 Department of Conservation, Hamilton, New Zealand. *"There is a lack of information regarding potential differences in exposure pathways between sediment and water-column-feeding shellfish species and the persistence of residual brodifacoum in shellfish. On this basis, residues may still be found in marine shellfish following aerial bait application, but the evidence so far suggests that the risk of secondary brodifacoum exposure to humans harvesting and eating shellfish is relatively low. Where this is a concern for proposed eradications, stipulating a no-harvest period linked to post-application monitoring is a prudent approach to confirming that there is no potential secondary human exposure as a result of consuming shellfish".*

Phillips, Reese <reese_phillips@fws.gov> Wed, Jun 14, 2017 at 1:37 PM
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Hello Fenix,

Thank you for your detailed comments. I will review the information and address it in the process of addressing the other comments to DEA.

Best regards,

Brand

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