CITIZENS for HEALTH

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Jim Rains
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Via email: jrains@cdfa.ca.gov

Comments in response to the Draft Programmatic Environmental Impact Report for the Light Brown Apple Moth Eradication Program

Dear Mr. Rains,

On behalf of Citizens For Health, I am submitting the following comments regarding the LBAM draft EIR. Should any clarification or documentation of any point made be desired, I would be happy to provide it.

Sincerely,

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Citizens For Health is a national public advocacy organization that addresses issues of both individual and environmental health. Roy Upton is a Soquel, California-based medical writer and editor and is the LBAM Liaison for Citizens For Health.

Comments in response to the Draft Programmatic Environmental Impact Report for the Light Brown Apple Moth Eradication Program

1. Many of the concerns raised in the Santa Cruz Scoping Meeting were completely ignored or inadequately addressed in this EIR.

As you know, CDFA held a number of EIR scoping meetings, which led to the drafting of this proposed EIR. There is a legal requirement for CDFA to consider the comments that were presented in those scoping meetings and many of these concerns went unconsidered or uncommented on in this draft EIR. For example, Citizens For Health submitted formal testimony that the environmental consequences of previous aerial spraying of Checkmate in Monterey and Santa Cruz must be reexamined for a number of reasons. First and foremost, there was an inadequate reporting system for the submission of human adverse effects and absolutely no mechanism for the submission of negative environmental effects. Thus CDFA cannot know the full consequence of either their previous or future treatment programs without examining the reports previously submitted by concerned citizens. We also consider that an integral part of safeguarding the health of Californians is accurate reporting on the part of State and Federal Agencies. Regarding CDFA specifically, we consider this Agency's representation of the potential health impact of the aerial spray to the public to be inaccurate and misleading.

Regarding human adverse effects, to our knowledge, there has not been a systematic review of these to date, including the near fatality of a young boy in Monterey and several other children in the Monterey and Santa Cruz areas who suffered from acute respiratory distress concomitant with the aerial spraying. Considering a substantial portion of the particle size of the microencapsulation delivery system was PM 10, there is ample reason to believe these events were correlated, yet no interviews with the subjects who reported these effects were conducted. Moreover, CDFA consistently claimed there was no correlation between the aerial spraying and any adverse effect reported. This allegation was contrary to the findings of a consensus statement of the Department of Pesticide regulation (DPR), the Office of Environmental Heath Hazard Assessment (OEHHA), and the California Department of Public Health (CDPH) which concluded;

"…not enough information was available to determine if there was or was not a link between the symptoms and the pheromone applications. The possibility that some of the symptoms were caused by the application could not be ruled out." And "…due to the positive results of one of two dermal sensitization assays on the products, we cannot dismiss the possibility that in sensitive individuals, contact with the particles could cause allergic-type responses…we cannot definitively determine whether or not there is a link between the reported symptoms and the Checkmate applications…"

DPR, OEHHA, CDPH Consensus Statement, Nov 3, 2008

Moreover, representatives from OEHHA informed a group of citizens in Santa Cruz that it is almost impossible to make a direct correlation between a pesticide treatment and human adverse effects. Thus, the actual human impact of any pesticide

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treatment program is impossible to know, but never-the-less, may be substantial. Without sufficient systems for actually determining the human impact of CDFA pesticide programs, no program should be initiated.

2. The premise of the EIR regarding the necessity or the ability of LBAM to be eradicated is almost completely unsupported based on the scientific literature and opinions of experts. Thus, any proposed program represents unnecessary exposure of communities and the environment to pesticides and an unnecessary cost to taxpayers.

Regarding the necessity to eradicate LBAM, CDFA/USDA makes the following contentions:

a. LBAM is a "recent introduction to the Continental US";

b. LBAM "feeds on a broad range of plants and forest species of great economic and environmental value";

c. LBAM populations are "small and localized";

d. Eradication is justified based on projected crop damage and restriction of markets due to trade quarantines;

e. Establishment of LBAM would result in increased use of pesticides in agriculture and home use.

In 2007, two Petitions were formally submitted to the USDA and the CDFA calling for the reclassification of LBAM based on the premise that LBAM is a minor insect that is easily and cost-effectively managed in crop systems. These Petitions provided citations supporting these premises. The USDA convened several panels to review the Petitions and subjected its response to the Petitions to the National Academy of Sciences (NAS) for an "an objective technical evaluation" and to determine if APHIS/USDA conducted a thorough and balanced analysis supporting the Agency's conclusions in its Response.

In its September 14, 2009 Draft Response to the Petitions, the USDA denied the request to reclassify LBAM as follows:

"The study concluded that LBAM is an invasive pest of economic importance because it poses a significant threat to America's agriculture and natural resources."

With regard to the request for Reclassification of LBAM, the NAS concluded:

"…the committee found that APHIS did not fully consider and address the specific arguments and did not conduct a thorough and balanced analysis supporting the conclusions in its Response."

In its response to the Petitions, USDA outlined its justification as to the risk that LBAM presents to agriculture and native flora. In this regard, the consensus of the NAS Committee was that USDA's scientific justification was "lacking", "flawed", "misrepresented", and that the risks of LBAM biologically and economically were "exaggerated".

The NAS review further stated that "the APHIS response would greatly benefit from the use of more robust science to support its position." Thus, before CDFA engages in any further continuation of the LBAM eradication program, an independent scientific review of the published literature, on the necessity and ability to eradicate LBAM, should be conducted. Without scientific support to substantiate either the need for the program or the ability to successfully eradicate LBAM there is no justification to subject urban and rural areas to the myriad of pesticides proposed to be used.

The LBAM Reclassification Petitions represent a review of more than 70 years of published literature as well as consultation with numerous LBAM experts worldwide. None of the premises used by CDFA to justify the LBAM eradication program appear to be supported.

Regarding the premise that LBAM is a recent introduction, this is no longer supported. Originally, CDFA alleged that LBAM was a new introduction to California in 2006 with the identification of LBAM by Dr. Jerry Powell. At that time, both Dr. Powell and USDA entomologist John Brown expressed that LBAM could not have been a new introduction considering its populations. CDFA acknowledges that LBAM has been in California for "several years", and, in actuality, USDA has been intercepting LBAM at points of entry into the Continental US since 1984 (Venette et al. 2003), the first year that LBAM was restricted as a "species of concern" in the US.

Regarding LBAM's polyphagous nature, this polyphagy is a characteristic of many general insects. Simply because an insect can host or feed on a plant does not mean it will have an economically or environmentally detrimental effect on the host. It is now widely established that LBAM is a leafroller that predominantly does superficial, transient, and sporadic damage to leaves, rarely damages any crop of economic significance, and often is of no economic consequence in terms of biological damage. These facts have been acknowledged by a US trade representative (Fedchock 2007) and are supported by 70 years of published scientific literature on LBAM (Bernard et al. 2007; Evans 1937; Danthanarayana 1983; Geier and Briese 1981; Southwood and Comins 1976). It is also well established that LBAM prefers herbaceous weeds as hosts, not economically valuable crops, and that crop damage only occurs incidentally to superficial leaf feeding (Collyer and van Geldermalsen 1975; Evans 1937; Geier and Briese 1981). Thus, representations by CDFA that LBAM "attacks" crops are unfounded. In actuality, polyphagy is a characteristic that prevents insects from becoming a significant biological pest to any specific crop. For CDFA to continue to represent polyphagy as a characteristic that is then used to extrapolate economic damage to crops is inappropriate and not supported by the published literature.

In terms of CDFA's allegation that LBAM represents a biological threat to native forests, this is completely unsupported by the scientific literature and real world experience, and numerous formal reviews of LBAM populations in forests have been conducted with none showing it is an environmental threat (Bogenschuetz 1991; Common 1961; 1990; Evans 1937; Kay 1991; Kew Gardens 2008; Moore 1963; 1972; Nicholas and Brown 2002; Nuttal 1983; Ohmart et al. 1983; Ramsden et al. 2002; Tilbury 2008; Winter 1985; Woinarski and Cullen 1984). Nowhere in the world where LBAM is endemic does LBAM cause any damage or environmental significance to native flora. CDFA is misrepresenting this alleged threat as part of its justification that the LBAM eradication program is needed. Moreover, the National Academy of Sciences review of USDA's response to Petitions to Reclassify the Light Brown Apple Moth, citing a number of these same aforementioned citations, agrees that the scientific literature does not support that LBAM represents any environmental threat to forests.

With regard to the premise that LBAM can be eradicated because populations are "localized" and "small", it is now known that LBAM in fact inhabits a range encompassing more than 25,000 square miles from Sonoma to Los Angeles with populations representing potentially in the millions to tens of millions. CDFA in the EIR also alleged that the LBAM "infestation" had "spread from 9 counties to 12 by mid-2008." There is no evidence to suggest that LBAM has spread. In fact, the population dynamics of LBAM suggests that it would be impossible for LBAM to spread over an area of more than 25,000 square miles from Sonoma to Los Angeles in the short time that CDFA claims LBAM has been in California. Similarly, based on CDFA's trapping data as reflected in their Daily Situation Reports, populations of LBAM are increasing as a result of increased trapping. There is similarly no evidence to suggest that population densities are increasing, and population fluctuations reflected in the trapping data simply represent cyclical changes indicative of most insects.

With regard to justifying eradication because LBAM will cause crop damage and restriction of markets due to trade quarantines, these assertions are not supported. Today, in the range of pests of potential economic significance in New Zealand, where LBAM is endemic, the leafroller complex is a relatively low priority and is rarely a problem, with most economic damage to crops due to other pests. Based on USDA pre-clearance inspection of New Zealand commodities, it is apparent that agriculture practices in New Zealand effectively control for LBAM with 134 *suspected* LBAM finds in approximately 55 million pieces of fruit from 2000 to 2004. These data demonstrate that New Zealand's pre- and post-harvest practices for these commodities are adequate in mitigating pathway risks for LBAM. New Zealand has been a significant exporter of apples for more than 40 years and ships to more than 60 countries. New Zealand has also been shipping apples to the US since 1969, totaling approximately 9400 million fruits, some prior to the USDA-required pre-clearance inspections. The findings of the current USDA fruit inspection record data are the result of the pipfruit industry, which adopted several leafroller risk reduction steps including highly effective integrated fruit production (IFP) pest management programs, high pressure apple washing, fruit grading, and end-point quality control carton inspections. Since the implementation of the IFP program there have not been any field control failures of leafrollers in either Central Otago or Hawke's Bay, and as evidenced by USDA pre-clearance data, the program has delivered an extremely high level of leafroller control (MAF 2005). Today the incidence of leafroller larvae within the New Zealand apple crop is negligible (MAF 2005). Formal cost assessments of IPM controls have shown these to be, at worst, cost neutral and once established likely to save growers money (Rapley 1999).

The ability to control LBAM and leafrollers overall appears to be further supported by the lack of attention paid to leafrollers in formal agricultural reviews of the New Zealand Ministry of Agriculture and Forestry (MAF). MAF monitors the financial status of farms and orchards and documents trends and sector concerns throughout the entire region and across all commodities. A review of several of these reports from 2000 to 2006 (e.g. MAF-HMR 2003; NCMR 2006; Perley et al. 2001) revealed no concerns regarding LBAM from either the Northern or Southern islands of New Zealand, suggesting that LBAM is being effectively managed with current practices or is not considered a pest of significance beyond the need to meet international export quarantine requirements, primarily to the US.

A further testament to the lack of economic significance associated with LBAM, LBAM was first identified in Hawaii in 1896. Subsequent to the issuance of USDA quarantines the Hawaii Department of Agriculture reported that LBAM had never been a pest of significance anywhere in Hawaii (Hawaii Department of Agriculture 2007a) and Hawaiian imports had never been quarantined due to LBAM (Reimer 2008, personal communication). This is despite huge quantities of cut flowers being exported from Hawaii into various parts of the US. Upon the formal identification of LBAM in California in 2007 (identified as being present in 2006) USDA issued quarantines against exports from Hawaii and required LBAM-specific inspections on nearly all plant material shipped from Hawaii. LBAM-specific inspections were established only a few days after the quarantine was issued (May 2, 2007). From that time until August 2008, no shipments had been rejected, due to LBAM demonstrating a low transport potential of LBAM from Hawaii (Cravalho 2008, Reimer 2008, personal communications).

According to officials with Hawaii's Department of Agriculture and Pest Control Desk, since the introduction of LBAM to Hawaii, LBAM is reported to almost exclusively occupy the higher and cooler elevations of the Hawaiian islands. LBAM has a wide host range and is found in small sporadic populations, primarily at the higher elevations, where its preferred hosts are gorse and blackberry, both invasive plant species. Despite its dispersal and 112-year history on the various islands, prior to the USDA quarantines imposed in 2007 no farmer had ever reported LBAM to pose any threat to their crops, and it has always been considered an incidental pest with no threat to Hawaii agriculture or native plant species at any elevation. Although most of the agriculture in Hawaii is conducted at the lower elevations, where LBAM is difficult to find, there are some cut flower nurseries and vegetable producers (e.g. lettuce) which are raised at higher elevations and are similarly unaffected by LBAM's presence.

Despite LBAM having a large host range in Hawaii, the moths themselves are reportedly very difficult to find in the fields. More significantly, prior to the implementation of the USDA quarantine restrictions, none of Hawaii's trading partners, including Canada and Mexico, had any import restrictions against Hawaii, and the presence of LBAM in Hawaii never engendered a formal program or protocol for its specific management. No domestic or international shipments of propagated or unpropagated plants were ever regulated for LBAM, nor were shipments ever rejected due to the presence of LBAM. Since the genesis of the USDA quarantines until August 2008, no plant material has been rejected due to LBAM. Now, Hawaii farmers, nurseries, and cut flower dealers all must implement varying controls to satisfy USDA requirements and the new requirements of trading partners. Moreover, farmers are concerned that the pheromone traps that are required to be used will draw the moths to the fields creating a problem where none ever existed before (Cravalho 2008 and Reimer 2008, personal communications).

Regarding the premise that establishment of LBAM will cause increased pesticide use in agriculture and home gardens, both assertions are completely unfounded. In the several years that CDFA acknowledges that LBAM has been present in California, and despite the presence of high densities and populations in San Francisco and Santa Cruz counties, there is no evidence of any such increased pesticide use due to LBAM among homeowners, nurseries, or farms. As evidenced by the almost complete lack of damage to any crop due to LBAM, prior to the quarantines being issued by CDFA, no farmer was aware of the presence of LBAM. Similarly, prior to the "hungry pest" campaign of USDA, there is no evidence to suggest that homeowners were aware of LBAM. The same is true of nurseries; prior to the quarantines, leafrollers were occasionally observed but seldom caused damage and rarely resulted in increased pesticide use. There is no scientifically valid information that LBAM's presence anywhere in the world causes increased pesticide use in homes or nurseries. In agriculture settings, pesticide use is predominantly employed to meet US quarantine requirements not to prevent crop damage.

3. The manner in which eradication is defined by USDA is not supported by the scientific literature and is not consistent with LBAM biology.

From a standard entomological perspective, eradication is defined as "complete elimination of a species from a particular area." (Flint and Gouveia 2001; Norris et al. 2003) or "the elimination of every single individual of a species from an area to which recolonization is unlikely to occur" (Myers et al. 1998). Also, according to published scientific literature pest populations can be described in three primary categories "infested zones", "transition zones", and "uninfested zones". Each is characterized by varying levels of detectability, as determined by trapping mechanisms. The ability to detect the pest proportionately decreases with increasing distance from the center of the most dense infestation into the transition zones, with only a marginal ability to detect sporadic individuals and the outer edges of the transition zones having established populations but at densities that, without extensive trapping, will remain undetected for years or decades (Sharov 2004).

Specifically with regard to LBAM, the scientific literature firmly establishes that LBAM has the ability to sustain populations below limits of detection even in the most favorable of habitats and host plants, is episodic, and has sporadic patterns of distribution (Danthanarayana 1983; Geier and Briese 1980, 1981). This was demonstrated in 1973 when a drought decimated a variety of insect populations in Eastern Australia. LBAM populations rebounded demonstrating the ability to recover from severe environmental pressures (Danthanarayana 1983). It is also demonstrated by the fact that CDFA, by its own admission, acknowledges that LBAM has been in California for at least "several years" (since at least the late 1990s). Yet, trapping for LBAM in the area of central California in 2005, where LBAM populations are highest, failed to detect any. CDFA has used this lack of LBAM finds in 2005 as evidence that LBAM was a recent introduction and could therefore be eradicated.

CDFA is defining eradication of LBAM as "Two LBAM lifecycles with no detection.", a definition that does not appear to be supported scientifically based on biological principles or standard entomological understanding.

Thus, even several lifecycles without detection would be the norm for LBAM, not the exception, and would have no correlation with the eradication of the species. The lack of LBAM finds from the 2005 CDFA LBAM trapping program show that LBAM populations of hundreds-of-thousands or millions can go undetected, perhaps for at least the several years estimated by CDFA. CDFA's use of terminology such as "eradication" that is inconsistent with accepted scientific and entomological standards is contrary to the Sound Science mandate required under the Plant Protection Act. Such inappropriate terminology reflects the desire of the governing agency to declare political eradications not biological eradications.

4. None of the Programs outlined in the EIR have ever been shown to successfully biologically eradicate an insect as polyphagous as LBAM, and specifically in urban areas.

The Plant Protection Act requires that eradication programs be supported by Sound Science. There is no scientific evidence anywhere to suggest that an insect as polyphagous as LBAM can be eradicated over such a large and diverse area as is represented by California. All assertions made to the contrary by CDFA to date, such as "successful" eradication of the pink bollworm have little to no relevance to LBAM. Pink bollworm has a single host (cotton) and inhabits relatively homogenous areas (plantations), which can be more effectively treated than polyphagous insects across a diverse terrain. Despite this, current claims of success with the pink bollworm have been challenged.

The LBAM TWG specifically noted that populations of LBAM would have to be reduced through the use of direct biocidal agents if any of the other techniques, such as pheromones and sterile insect technique (SIT), were to be effective. Moreover, the EIR fails to address a myriad of problems that can occur in using the proposed eradication tools. First and foremost, widespread use of pheromones through the use of twist ties or aerial sprays results in a blinding of the trapping, which is an integral component of any long term eradication or control program.

Table 16.3 in the EIR outlines the tools proposed for eradication. This table has a number of misrepresentations and inaccuracies. First and foremost, as noted above, neither pheromones nor SIT have been shown to be effective for eradicating polyphagous insects over a diverse terrain and in urban areas. Even directly insecticidal agents have never been shown to be effective for eradicating LBAM from urban areas. Most notably, LBAM has been shown to quickly develop resistance against even biocidal agents, while other leafrollers have been shown to become resistant to pheromone treatments. Thus, there is no scientific basis for considering these tools to be effective for eradicating an insect such as LBAM.

5. Alternative Programs Eliminated From Consideration

CDFA has specifically eliminated numerous control measures that have been proven to be effective from use in the program because they did not constitute "eradication" tools. Most of the tools recommended by CDFA, including pheromones and SIT were designed predominantly as control tools (pheromones) or have been found to be control tools (SIT). Most specifically, IPM practices, as employed in New Zealand have been shown to be highly effective at controlling LBAM to levels where damage to crops is rare and the ability to export commodities internationally is cost-effectively achieved.

6. No Program Alternative Not Adequately or Appropriately Addressed

CDFA completely discounts a no program alternative on the premise that the government somehow is more efficient and judicious at applying pesticide controls than agriculture interests. As clearly evidenced by this LBAM eradication program, it is CDFA and USDA quarantines which have driven the widespread use of pesticides, including organophosphates and scheduled treatments, not the biological threat of LBAM. As evidenced in New Zealand, highly effective and cost-effective IPM practices for the control of LBAM are available and, as evidenced in Hawaii, a lack of treatment for LBAM has never resulted in economically significant damage to any crop, ever.

7. A No Treatment Option by Government Does Not Mean There Will Be No Control of LBAM

Another driver of the LBAM eradication program is the premise that a no treatment option will mean that LBAM will proliferate unchecked. This is an incorrect assumption. The scientific literature as well as real world experience is very clear regarding the high rate of parasitization and predation of LBAM that is characteristic of many general insects. There were initial concerns raised that because LBAM was a "recent introduction" that there were no naturally occurring parasitoids or predators that would provide adequate control. Again, this is an incorrect assumption.

Like many tortricids, LBAM is a general insect with both specific and general predators and parasitoids (Mills and Carl 1991). All stages of the life cycle of LBAM are impacted by natural enemies including general predators such as: ants, bats, beetles, birds, earwigs, flies, lacewings, small mammals, spiders, viruses, and various parasitoids. The characteristic movements of leafroller larvae make them particularly vulnerable to predators, especially spiders, which rely on movement to detect prey and are reported to be a favored predator of LBAM. In Australia and New Zealand, the scientific literature over the past 40 years demonstrates that LBAM is subject to levels of mortality as high as 90% to 99% with a survival rate of only 1% from egg to pupae (Geier and Briese 1980; MacLellan 1973; Thomas 1989). In Australia and New Zealand, the most important factors determining total generation mortality are egg mortality in spring and autumn-winter generations and first instar larval mortality in the summer generation. After impacts on egg and first instar mortality, sixth instar mortality may determine population trends (Sutherst et al. 1997). Mortality of instar VI and pupal stages ranked next to mortality of eggs and/or first instar larvae in limiting populations the following season. Later larval stages are less susceptible to mortality than younger earlier stages (Danthanarayana 1983). Mortality of first instar larvae and eggs is a key factor in determining the trends from one season to the next. Knowing these parameters allow for treatment in agriculture settings when needed.

Among the primary causes of LBAM mortality, in addition to a lack of fecundity, are parasitization and predation, especially in the absence of organophosphates or other factors that reduce beneficial predators. In many cases, parasitization and predation are the primary controls for LBAM, though the literature suggests that lack of fecundity is similar to predation in terms of impact on LBAM mortality (Danthanarayana 1983). According to demographic studies predators and parasitoids have been repeatedly shown to cause the greatest degree of insect mortality when compared with other factors such as competition, weather, and plant effects (Gurr et al. 2005). Almost all orders of predatory insects have been recorded as feeding on tortricid larvae or pupae (Danthanarayana 1983; Geier and Briese 1981; Mills and Carl 1991) and empirical evidence suggests that parasitoids disperse more as the parasitoid to host larvae ratio increases (Hastings et al. 2005). Additionally, because LBAM does not diapause, synchronization with specific predators or parasitoids need not occur (Mills 2008), undoubtedly one of the primary reasons for the high degree of mortality observed in LBAM populations. A rate of parasitism of 50% to 60% can allow for individuals to carry over to the next season, while higher rates of parasitization can result in negative growth for that season. In terms of potential for damage to crops, in grapes, a reduction in larvae of 30% to 50% can reduce populations to below damage thresholds (Sutherst et al. 1997).

MacLellan (1973) was among the earliest to report as high as a 99% mortality of LBAM in a young pesticide-free orchard. Specifically, MacLellan (1973) reported high rates of mortality of larvae after egg hatching and before spinup of 87.2% in 1962-1963 and 86% in 1963-1964 seasons. Parasitoids, predators, and a nuclear polyhedrosis virus were responsible for mortality of larval instars II-IV. According to MacLellan (1973), high rates of mortality were reported for established larvae in the same seasons at 61.2% and 57.4%, respectively. The same author reported on mortality of pupae, predominantly by parasitization, of 43.5% and 60.5% and noted that in the two seasons studied, the survival of pre-adult stage LBAM was less than 1%. According to the work of Collyer and van Geldermalsen (1975), young first-instar larvae suffer 80% to 90% mortality in their initial dispersal phase before becoming established on foliage. In support of these earlier findings, Geier and Briese (1980) reported that 85.1% to 93.8% of neonates are lost to predation between hatching and establishment of spinups. The same authors reported that only 5.8%, 9.0%, 11.3%, and 11.6% of first instar larvae survived after hatching due to predation, likely by spiders. According to Danthanarayana (1983) mortality of first instar ranged from 8% to 84.3% at one location and 26.9% to 90.7% at another site and was one of the primary factors contributing to total generation mortality. Thomas (1989) reported egg parasitism on citrus foliage of 90% in autumn (in New Zealand) and 10% in spring. Suckling et al. (2001), report varying levels of first instar parasitism by *Dolichogenidia tasmanica*, an LBAM parasitoid native to Australia, of varying levels in different host plants (e.g. apple, broom, clover, etc.) and under various experimental conditions. Other LBAM literature shows that tortricids, in general, show a level of egg parasitism of up to 30%; larval parasitism up to 69.9% (Lo and Walker, unpublished data as reported by MAF 2005), and pupal parasitism to 70% (Mills and Carl 1991). Other authors reported similarly high levels of mortality from environmental pressures (e.g. Buchanan 1977; Thomas 1989).

The same literature details that when biocide controls are either not used or discontinued and populations of natural predators are healthy only 7% of eggs survive to develop into mature larvae, only 1% of eggs survive to pupate, and less than 1% (e.g. 0.7%) of pupae survive to adulthood (Geier and Briese 1981, MacLellan 1973). These findings may be significantly compelling and suggestive of even potentially higher levels of parasitism since most of these findings were at a time when organophosphates were widely used, which would have had a significantly detrimental effect on LBAM predators. With heavy insecticide use, parasitism can drop to as low as 20% to 51% (Thomas 1989). It has been demonstrated that the discontinuation of organophosphates results in greater degrees of LBAM parasitism due to an increase in beneficial predators (Geier and Briese 1981). The success of the discontinuation of scheduled organophosphate use and the promotion of natural predators along with well-timed control measures is evidenced by USDA pre-clearance inspection data that show a high degree of LBAM control has been obtained for apples (MAF 2005), cherries (USDA 2006), and a variety of crops.

This high level of natural mortality is supported by current experience in New Zealand agricultural management of LBAM where mortality of LBAM prior to maturity is reported to be as high as 80% to 90% (Shaw, as reported by Harder and Rosendale 2008). Additionally, the ability of natural predators to provide almost complete suppression of LBAM populations was demonstrated in field experiments in New Zealand. HortResearch research entomologist Peter Shaw (Harder and Rosendale 2008) reported that, at Nelson/ Motueka (New Zealand);

> "control [apple] trees with no insect or chemical controls used have not recorded any damage from LBAM or other leafrollers for more than 10 years."

Additionally, HortResearch staff attempted to force LBAM infestation of the same trees by introducing LBAM eggs and larvae into the trees to no avail. Native predators quickly controlled any attempted infestation of the trees by LBAM. According to Shaw;

"Once organophosphates were removed from the system and populations of beneficials were left to develop naturally, complete control of LBAM was realized in less than 5 years."

When organophosphates were compared to natural controls in consistent blocks of apples, sufficient control of LBAM to maintain thresholds was achieved with natural controls in less than two years. This trend was formally noted in a more recent survey of New Zealand agricultural practices (MAF 2005) and is supported by the historical literature (Buchanan 1977; Geier and Briese 1981; Thomas 1989, among others).

In addition to predation and parasitization, numerous other factors routinely serve to control LBAM populations. LBAM cannot lay eggs, sustain populations, and in some cases, cannot survive high (31 ˚C/87.8 ˚F) and low temperatures (5 ˚C/41 ˚F) during the growing season. Drought can also completely decimate LBAM populations both due to sustained high temperatures and due to a loss of food sources (Danthanarayana 1975). While less of an issue in crops under irrigation, drought affects the carrying capacity of the surrounding environment thereby limiting populations. A naturally occurring nuclear polyhedrosis virus common to orchards has also been shown to be a relatively common antagonist leading to cyclical decimation of LBAM larval populations. Extracts of this virus have also been employed as a biological control by spraying on plants (Thomas 1989).

In New Zealand agriculture, leafrollers continue to be subject to a high degree of monitoring due to a need to provide blemish-free fruits for export markets and to meet the zero-tolerance requirements of the US (Irvin et al. 2006). Today, neither Australia nor New Zealand have difficulties meeting the US zero-tolerance for LBAM or other countries. Both countries rely on standard integrated pest management practices to meet these quarantines and utilize monitoring to determine if and when treatments at specific agricultural production sites are needed.

8. Natural Control of LBAM in California

There are more than 300 tortricids in California, of which approximately 75 are leafroller species. Many of these have effective parasitoids (e.g. *Cotesia, Exochus, Macrocentrus, Nemorilla*, and *Trichogramma* species) and predators (e.g. *Orius tristicolor*, *Chrysopela* spp., and *Phytocoris*) (Varela et al. 2008). Most if not all leafrollers are general insects that are subject to a high degree of natural control by general predators. California and all parts of the US are replete with the general predator families observed to attack LBAM. Moreover, native California *Trichogramma* wasps have displayed a high degree of parasitization against LBAM both in laboratory and field settings. Because LBAM is a leafroller and therefore is protected within the shelter it creates, biological treatments, such as parasitoids and predators are among the most effective control tools in contrast to applied chemical treatments, from which LBAM is protected during most of its development (Buchanan 1977). Development of resistance to even harsh pesticides such as organophosphates is also a notable problem that limits the potential of chemical control treatments for LBAM (Collyer and van Geldermalsen 1975; Lo et al. 2004; Suckling et al. 1984; Wearing 1998).

In pilot studies by CDFA, native *Trichogramma* wasps showed a relatively high level of parasitism against LBAM (Roltsch 2008a). In one presentation of *Trichogramma* egg parasitization CDFA reported a mean of 61% and 38% larval parasitization for the wasps *T. pretiosum* and "*T. platneri"* (later reported by Roltsch as *T. minutum*), respectively with rates of parasitism as high as 96% by *T. pretiosum*. In a follow-up presentation, the same researcher reported on egg parasitization with native California *Trichogrammas* of 51% and 31% for *T. pretiosum* and *T. platneri,* respectively, and described a rate of parasitism of 30% to 40% as having a significant impact in reducing populations. Roltsch (2008b) further reported that the lower percentage of parasitism observed for *T. platneri* was likely anomalous, with equal rates of parasitism likely for both species. When eggs were reared on sentinel plants, plants that can be used to increase the attraction of predators to a field (e.g. fava beans), rates of parasitism of 80% and 90% were observed (Roltsch 2008b). Similar high rates of parasitism of LBAM with the use of sentinel plants have been described in the literature (e.g. Begum 2004; Begum et al. 2006; Irvin 1999; Irvin et al. 2006; Thomas and Burnip 1993) with even the colors of plants showing various degrees of effectiveness in drawing predators to the fields.

Roltsch (2008b) also reported on searching extensively in Golden Gate Park, San Francisco for signs of LBAM life stages and found it on only one specific preferred host plant, *Leptospermum laevigatum* and nowhere else in the park. San Francisco is almost ideal for LBAM in terms of temperature (14 ˚C/57 ˚F) and humidity (62% to 84% afternoon and morning, respectively). The optimum temperature range for LBAM is 15 to 25 ˚C (59 to 77 ˚F) and 70% humidity. Golden Gate Park is also ideal in that it has a great concentration of favorable host plants. Additionally, San Francisco has been found to have the highest density of LBAM finds in all California counties thus far. This supports the earlier findings of Danthanarayana (1983) as well as the experience of experts in Hawaii (Reimer 2008, personal communication) in reporting the theoretical ability of LBAM to host in multiple habitats but only finding sporadic populations due to a high degree of mortality.

CDFA in follow-up studies showed similarly high levels of LBAM parasitization by *Trichogramma*. In a June 2008 experiment, 18% of LBAM eggs were parasitized by *Trichogramma* in 48 hours. This was followed by varying degrees of parasitization of (71%, 72%, 42%, 18%, and 51%) (50.8% average) across several experiments. These findings are seminal and also likely to be low projections as the duration of the studies were only 24 and 48 hours. In the field, there is much greater exposure to potential parasitization and mortality in general over the three-week time period from egg to pupae (Roltsch 2008c).

Mills (2008) also established that in addition to parasitization by native California *Trichogramma*s, parasitization of larvae by *Meteorus trachynotus* and *Entyus eurekas* also occurs. It was further noted by Mills (2008) that this is different than all other California tortricids, which only have a single parasitoid each, suggesting a greater level of parasitization, by different parasitoids, is happening with LBAM as compared to native tortricids. In July 2008, Mills reported that as of that date 13 parasitoids were identified in California. This further suggests that natural parasitization of LBAM in California is greater than for all other leafrollers, most of which do not constitute economically significant threats. This high degree of parasitization along with the high level of predation that occurs is likely the reason why LBAM has not been prominent in agriculture settings.

In addition to predation and parasitization, numerous other factors routinely serve to control LBAM populations. As noted, high temperatures and freezes contribute to the control of LBAM, as can drought. It is important to remain cognizant of the fact that these early observational findings of LBAM's biology represented in the published literature are based on more than 100 years of LBAM having been introduced into those regions.

With regard to the issues discussed above, we pose the following questions and await responses.

Questions

• Why did the near fatality of Jack Wilcox in Monterey go uninvestigated?

• Once CDFA realized the microcap delivery system for the Checkmate aerial spray was actually contributing to PM 10 pollutants why did other reports of acute respiratory distress go uninvestigated?

• Once CDFA realized the microcap delivery system for the Checkmate aerial spray was actually contributing to PM 10 pollutants why did the Agency continue to report there was no correlation between the adverse effects reported and the spray?

• What reporting systems will be put in place to facilitate the reporting of future potential human and environmental health effects should CDFA proceed with future LBAM treatment programs?

• What documentation does CDFA have to show that the proposed reporting systems will be sufficient for determining a cause and effect relationship between its treatment programs and potential human adverse effects?

• Considering that the Consensus statement of DPR, OEHHA, and the CDPH of November 3, 2008 concluded that symptoms experienced by those sprayed could have been due to "allergic-type responses" caused by the spray, why did CDFA continue to mislead the public into believing there was no correlation between the spray and the symptoms experienced by Monterey and Santa Cruz residents?

• Considering that CDFA was unaware of some of the potential health hazards of its previous treatments, how will CDFA protect Californians and the California environment from unexpected health hazards that may not be known prior to exposure of hundreds of thousands of residents and millions of acres to the proposed chemical treatments?

• Why were reports of dead pets after the aerial spraying in Monterey and Santa Cruz area not investigated?

• Why were reports of dead bees after the aerial spraying in Monterey and Santa Cruz area not investigated?

• Is CDFA aware that components of Checkmate including urea, tricaprylmethylammonium chloride, ammonium phosphate, and sodium phosphate can feed the microplankton that give rise to red tide?

• Regarding the dead seabirds, the formal conclusion of CDFA was that the deaths were due to red tide. Why was the potential association between the spray ingredients, the higher than expected concentrations of the spray ingredients in the Monterey Bay due to the runoff, the red tide, and the dead birds not investigated?

• If cause and effect relationships between pesticide treatment programs and adverse events reported after human exposure cannot be determined, what will CDFA do differently in investigating future adverse events that are reported?

• Considering that LBAM has been found at points of entry in the US for 25 years, that CDFA now acknowledges that LBAM is not a recent introduction to the US, that numerous experts state that LBAM is not a recent introduction to the US, why does CDFA/USDA continue to portray LBAM as a "recent introduction"?

• What is the scientific basis for considering an exotic insect a "recent introduction" and what is the scientific basis for considering an insect as "established"?

• In light of the numerous formal surveys that demonstrate that LBAM does not constitute an environmental threat to native trees anywhere it is endemic, and the agreeing opinion of the National Academy of Sciences, what is CDFA's justification for continuing to use this as justification for continuing the LBAM eradication program?

• What criteria is CDFA using to define populations as "small" and "localized"?

• What criteria will CDFA use to determine that LBAM populations are no longer "small" and "localized"?

• What scientific basis is CDFA using to suggest that LBAM populations are spreading versus being detected due to increased trapping?

• What basis is CDFA using to suggest that LBAM populations are "increasing" versus simply experiencing cyclical emergences and falls?

• What is the current opinion of the LBAM TWG regarding the ability to eradicate LBAM from California?

• In light of the NAS review of the position of APHIS regarding the lack of scientific justification for the alleged biological and economic threat of LBAM, what is the scientific basis that CDFA is using to justify continuation of the LBAM eradication program?

• Does CDFA agree with the findings of the National Academy of Sciences review? If yes, how has the NAS review caused CDFA to modify its policies or programs regarding LBAM? If no, in what areas does CDFA disagree with the findings of the NAS review?

• What is the current opinion of the LBAM Technical Working Group (TWG) with regard to both the need and ability to eradicate LBAM from California?

• Eradication was chosen over control because CDFA considers eradication to be "feasible". On what scientific basis does CDFA continue to believe that eradication is feasible?

• In Section FR.3 it states that eradication is expected to take 3-5 years. When CDFA first proposed eradication as a strategy in 2006, the Agency stated there was only a "short window" for eradication to be achieved. CDFA entomologist Robert Dowell, defined this short window as 2 to 3 years (Dowell 2008a) or by 2008-2009. What scientific basis was used to determine that it would take 2-3 years to eradicate and what is the scientific basis for believing eradication can be accomplished by 2014?

• In Section FR.3 it states that CDFA will maintain the federal Quarantine Order to "prevent the destructive spread of the LBAM infestation until eradication is accomplished…" As there has been no significant economic damage in regard to actual crop damage due to LBAM in the "several years" that CDFA has estimated LBAM has been in California, to what "destructive spread" is CDFA referring?

• On what scientific basis is CDFA's definition of a successful eradication of LBAM scientifically supported?

• Given that populations of most insects are characterized by often dramatic and cyclical rises and falls how can a definition of "eradication" as "Two LBAM lifecycles with no detection." be justified?

• If successful eradication is claimed in a specific area and LBAM is soon found again in the same area, will CDFA claim this is a "reintroduction" as they do with Medfly?

• What scientific evidence suggests that an insect as polyphagous as LBAM that inhabits a terrain as diverse and broad as California can be eradicated?

• What is the rate of efficacy of SIT as applied to LBAM?

• What level of efficacy of LBAM SIT is required so as not to cause an increase in LBAM infestation through the release of tens of millions of fertile LBAM?

• What level of inefficacy of LBAM SIT has the potential to cause an increase in LBAM infestation?

• What effects will occur to native insect-predator relationships by releasing tens of millions of LBAM?

• Considering that CDFA did not follow the recommendations of the LBAM TWG and that the TWG has not issued recommendations since 2007, who is currently guiding CDFA in the development and implementation of the LBAM eradication program?

• What is the LBAM TWG's opinion of the treatment programs and strategies proposed by CDFA?

• Regarding trade of agriculture commodities to other countries, why is it that Australia, the European Union, India, New Zealand, and the United Kingdom can maintain their access to international markets without having LBAM eradication programs, but the US cannot?

• What is the scientific basis for believing that natural parasitization and predation will not control LBAM to degrees that are not economically damaging?

• Is CDFA aware that Mills has reported there are 13 native California parasitoids against LBAM and that this is a greater number of parasitoids than exist for native California tortricids, most of which do not constitute economically damaging insects?

• Is CDFA aware of the paper of Gutierrez et al. (2009) that challenges the climactic and distribution model used by CDFA in projecting LBAM's range and potential for economic damage?

• What is CDFA's opinion of the findings of Gutierrez et al. (2009) regarding the climactic and distribution model they have proposed for LBAM?

• Is CDFA aware that in New Zealand, natural parasitization and predation is often sufficient to control LBAM without any chemical controls?

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