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Edited by
Sammie Lee Dickson

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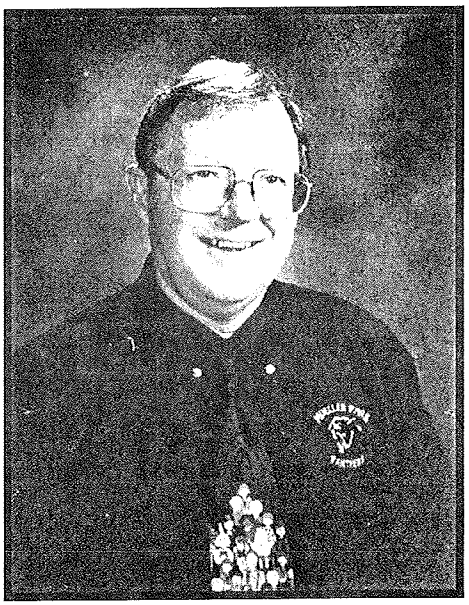
DR. DON MERRILL REES MEMORIAL AWARD



Dr. A. Bruce Knudsen

This award was created in 1987 by the Utah Mosquito Abatement Association to acknowledge exceptional contributions to mosquito control in Utah. The award honors **Dr. Don Merrill Rees**, 1901–1976, who was often referred to as the 'Father of Mosquito Abatement in Utah.'

Dr. Alvin Bruce Knudsen became the sixth recipient of the **Dr. Don Merrill Rees Memorial Award** on October 1, 2002. Bruce began his association with Dr. Rees when he initiated his undergraduate studies at the University of Utah in 1964. Earlier his studies were put on hold while he served a mission for the Church of Jesus Christ of Latter-Day Saints in Denmark.

Bruce then went on to receive his B.S. 1965, M.S. 1967, and Ph.D. 1970, all from the University of Utah. His masters and doctorate work were on deer and horse flies around the Great Salt Lake. Dr. Rees served as the Chairman of his Supervisory Committee for both his M.S. and Ph.D. Bruce spent the summers of 1965–1969 working as a field inspector at the Salt Lake City Mosquito Abatement District.

Dr. Knudsen went on to a long and varied career in public health. He started with the US Public Health Service in 1970; Research Assistant and Associate with the University of California, San Francisco and the University of Malaysia (1973–1975) and then spent 1976 through his retirement in 1997 with the World Health Organization (WHO). With WHO he served as a Scientist/Medical Entomologist and Advisor on Vector Borne Disease Control. Over his distinguished career Bruce published 52 articles relating to insects and disease, five of which were co-authored with Dr. Rees.

We in Utah are fortunate that Bruce has returned to his native state for 'retirement'. He is currently pursuing one of his true loves, teaching science to junior high school kids.

MERITORIOUS SERVICE AWARD

This award is presented to individuals who have distinguished themselves in administrative or technical service to mosquito control in Utah. The following people were presented this award in 2001:

Steve Flitton

Douglas Brown

Craig Nichols

Encephalitis Surveillance At The Utah Department Of Health: PCR On Mosquito Pools

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Abstract

Mosquitoes were collected by the Mosquito Abatement Districts across the state on five dates from July 6 to September 10, 2001. The mosquitoes were analyzed for the presence of the encephalitis viruses, West Nile Virus, Western Equine Encephalitis Virus, and St. Louis Encephalitis Virus by real-time polymerase chain reaction (PCR). A total of 96 mosquito pools were tested, no encephalitis viruses were detected.

Introduction

Encephalitis, an inflammation of the brain, can be caused by viruses that are transmitted between hosts by mosquitoes and can be fatal. For St. Louis Encephalitis Virus (SLE), Western Equine Encephalitis Virus (WEE), and West Nile Virus (WNV), humans are an incidental host, with birds being the natural host. SLE and WEE are endemic in Utah. With the rapid spread of West Nile Virus (WNV) westward in the United States, there is concern that this pathogen will reach this area soon. A grant from the Center for Disease Control and Prevention has allowed the Utah Department of Health to establish a surveillance program for these encephalitis viruses in the mosquito population and in avian brains.

Mosquitoes are trapped at several locations and transported to the laboratory for testing. The viruses would be located in the salivary glands of the mosquitoes and the abdomen following a blood meal. Ribonucleic acids (RNA) are extracted from the mosquitoes and purified. The RNA is translated into deoxyribonucleic acid (DNA), if the viruses are present, their DNA will be selectively increased during the (PCR) process. The increased DNA levels would be detected during PCR by special probes for each virus, the amount of activated probe is quantitated by the machine. A measured increase in activated probe indicated the virus was present in the mosquito. A similar procedure would be followed for brains of birds that are suspected to have WNV, SLE, or WEE.

Methods

Mosquitoes are trapped at specified locations using CO_2 based traps by Mosquito Abatement District personnel. The insects are collected in plastic tubes and placed on ice. The mosquitoes remain refrigerated until transported to the Utah Department of Health. The mosquitoes are crushed by addition of four sterile 4.5 millimeter copper-clad shot and vigorous mixing on a vortex for 45 seconds to 1 minute. The fluids are released from the

abdomen and salivary glands during a from the fluids using spin columns and a series of chemicals.

A reverse transcriptase enzyme is added to translate the single stranded viral RNA to the more stable DNA. Short pieces of DNA specific for WNV, WEE, or SLE (primers) are added to amplify the amount of DNA present. Another enzyme makes copies of the DNA that has this specific primer-viral derived DNA match. As the copies of DNA are made, the specific probes are activated. The amplification process is repeated 40 times, with each cycle increasing the amount of DNA exponentially. The amount of activated probe is detected as a pulse of light during each cycle for each sample. Viral presence in the sample is determined by probe levels twice the background level and amplification above a threshold value by the 37th amplification cycle. The entire process takes approximately four hours to complete, making it an accurate and timely test.

Results

A total of 96 pools were tested for SLE, WEE, and WNV from five sessions at two week intervals representing from five to seven Mosquito Abatement centrifugation spin. The RNA is extracted Districts per trapping event. (Table 1) No SLE, WEE, or WNV was detected in mosquito pools tested in 2001. One bird brain was tested this summer, SLE, WEE, WNV were not detected.

Table 1. Adult mosquito pools tested in 2001.

Date Trapped	#POOLS	#MAD
7/6/2001	13	5
7/20/2001	26	6
8/3/2001	18	7
8/17/2001	20	7
9/7/2001	19	6

Conclusions

The real-time PCR tests allowed rapid determination that the encephalitis viruses were not present in mosquito pools examined. Real-time PCR specific for SLE, WEE, and WNV in insect and bird populations adds a fast and accurate screening tool to the arsenal. The grant from the Center for Disease Control and Prevention has purchased additional CO_2 traps to be utilized by the Mosquito Abatement Districts to enhance surveillance for SLE, WEE, and WNV in Utah in the upcoming mosquito season. With increased public awareness of the movement of WNV, an increase in birds to be tested is anticipated.

NPDES: Potential Impacts To Larviciding Operations In California

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Background

On March 12, 2001 the federal Ninth Circuit Court of Appeals issued a decision in *Headwaters, Inc, v. Talent Irrigation District*, that created serious consequences for aquatic pesticide users in California. The Talent Irrigation District in Oregon applied an herbicide (Magnicide-H) to an irrigation canal to control aquatic weeds and vegetation contained within the canal. The herbicide flowed from the canal into a nearby creek, killing a significant number of juvenile steelhead. A lawsuit was filed by an environmental organization under the Clean Water Act, stating that the application of the herbicide without a National Pollutant Discharge Elimination System ("NPDES") permit violated the Act. The Ninth Circuit agreed, ruling that the Irrigation District must comply not only with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) by using the product according to the label, but also with the Clean Water Act when applying pesticides to "Waters of the US".

The California State Water Resources Control Board and Proposed NPDES Permit

In California, the Clean Water Act is implemented by the State Water Resources Control Board (SWRCB). (California is an authorized state to administer the NPDES permit. To see if your state is an authorized state, check http://www.epa.gov/npdes/.) In response to the Ninth Circuit Court ruling in the Talent Case, the SWRCB developed a draft statewide general NPDES permit for aquatic pesticides.

The Clean Water Act prohibits anybody from discharging "pollutants" through a "point source" into a "water of the United States" unless they have an NPDES permit. The SWRCB interpreted the Ninth Circuit Court ruling to mean that any application of an aquatic pesticide to be a discharge of a pollutant through a point source, and those applications that occurred in "waters of the US" required an NPDES permit. Permits generally contain limits on what can be discharged, monitoring and reporting requirements, and other provisions to ensure that the discharge does not impair water quality or people's health. In essence, the permit translates general requirements of the Clean Water Act into specific provisions tailored to the operations of each person discharging pollutants.

The permit drafted by the SWRCB contained many potential problems for mosquito control districts. The permit required the implementation of "Best Management Practices" designed to limit pesticide use, receiving water limitations, water quality monitoring and reporting requirements, and documentation and record keeping requirements substantially above what is already required for pesticide applications. Examples of the monitoring program include field monitoring of aquatic water sites after a

larvicide application to determine fate and transport of applied pesticides, an evaluation and confirmation through sampling the expected areal extent and duration of the pesticide's presence, mass loading of the pesticide, life cycle bioassessments on a range of species, a community monitoring survey to evaluate the cumulative impact of the applied pesticide on non-target plants and/or animals, and a full water quality analyses to demonstrate full restoration of water quality and protection of beneficial uses. In addition, the complicated and ambiguous identities of what constitutes "waters of the US" make comprehensive larval mosquito control impractical, if not impossible.

To comply with the draft permit, depending on how it is interpreted, could well exceed one million dollars a year for an individual district. Members of the Mosquito and Vector Control Association of California worked with SWRCB staff to develop a permit that would identify the process of applying target specific larvicides to prevent mosquito emergence. Initial drafts of the permit recognized the low toxicity of the pesticides used and the biology of mosquitoes that require expeditious treatments, and provided an exemption for mosquito larvicides. Unfortunately, opposition to grant exemptions for public health from the anti-pesticide community and EPA Region 9 resulted in them being removed.

The Adopted Permit

The SWRCB adopted a general "emergency" permit July 19, 2001 despite objections from the Mosquito Vector Control Association if California and several state legislators that urged the Board to exempt mosquito control larvicides from the permit. The short-term impacts this will have on mosquito control districts in California is unknown. Many districts in California have suggested they will stop all larviciding activities in or around "waters of the US", and will substantially increase adulticiding to reduce mosquito populations. Many districts will actively oppose wetland development, and a few have suggested they will take legal action against property owners that produce mosquitoes.

On August 30th, 2001 WaterKeepers, a self-proclaimed protector of California waterways, filed suit against the SWRCB challenging the "emergency exemptions" status for herbicide applications. The suit, however, specifically stated that they were not challenging the use of pesticides applied for vector control. The suit has not yet been heard in court.

Will this affect you, and What can You do?

The ruling currently holds true only for the states that fall within the jurisdiction of the Ninth Circuit Court. Unfortunately, the passage of a permit in California could result in a precedent that may eventually work its way east.

A Supreme Court reversal or legislative action would be long-term objectives to prevent the collapse of sound public health policy in the near future. To bring immediate and proactive public health results the US Environmental Protection Agency (USEPA) could promulgate an interpretive ruling that would state that federally registered pesticides applied according to the label are not pollutants as defined under the Clean Water Act. This interpretive ruling would be consistent with the interpretation USEPA has held for the thirty years the Clean Water Act and FIFRA have been law.

The American Mosquito Control Association (AMCA) urges Districts to immediately contact local legislators to

instruct USEPA to immediately issue an interpretive ruling that states the application of a FIFRA-approved aquatic pesticide for beneficial purposes according to approved label instructions is not a "discharge" of a "pollutant" under the Clean Water Act. In the event USEPA fails to act, AMCA urges districts to prompt legislators to introduce legislation to amend the decision of the Ninth Circuit Court to allow the use of public health pesticides without an NPDES permit.

The environmental movement for anti-pesticide use at any cost, despite the spread of West Nile Virus on the east coast and the finding of *Aedes albopictus* on the west coast, has gained ground with the recent court ruling. Scientifically sound, environmentally friendly, cost effective measures to protect public health from vector borne diseases may be irreversibly lost if this ruling is not reversed.

Mosquitoes Of Grand Teton National Park Teton County, Wyoming, Usa

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Abstract

An inventory of the mosquitoes of Grand Teton National Park and the John D. Rockefeller, Jr., Memorial Parkway was conducted during 1998 and 2000. Twenty-five culicid species belonging to 3 genera and 5 subgenera were recorded. This is the first substantive effort to record the mosquito fauna of this National Park since its establishment in 1929. Collection of *Ochlerotatus communis* and *Ochlerotatus nevadensis* specimens from the same larval site supports the species status of *Oc. nevadensis*.
(Moore, James P. 2001. J. Am. Mosquito Control Association. 17(4): 249 – 253)

Do Dead And Decaying Mormon Crickets In Utah's Source Of Drinking Water Pose A Public Health Problem?

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This was a good year for the Mormon Cricket (*Anabrus simplex),* a wingless Katydid (Tettigoniidae). The red immatures were encountered early in May on a field trip to Simpson Springs, Tooele Co., Utah in W. Central Utah. They sprang the traps, ate the bait and repelled rodents in the few traps that were not sprung.

Unless indicated otherwise, the following summary is from an hour program in which I participated on 10 July, 2001 on Radio West, KUER FM, University of Utah. Other participants were: Utah Department of Agriculture Entomologist Ed Bianco, Boyd Critchfield of the U.S. Farm Service, Craig Fuller of the Utah Historical Society, Larry Lewis of the Utah Agriculture and Food Department, Janet Lindquist of Oak City, Hal Shindler who was formerly with the Salt Lake Tribune, Stephen Sims who is Utah State University Anthropologist and Mark Stackhouse who was formerly with Tracy Aviary in Salt Lake City. Hosts of the program were: Doug Fabrizio, Steve Spencer and Kat Snow who provided the comments of Shindler and Stackhouse from a 1996 program. Adult Mormon Crickets are black and the length is about 2 in. for the male and 3.5 in. for the female, including the ovipositor (Fig. 1). Locals say that they have swollen heads with bulgy eyes, legs of steel wire on clock springs and are a cross between a spider and a buffalo. The Crickets have a pungent smell resembling a Stink Bug and the smell intensifies with numbers. Mormon Cricket males make a loud, clicking sound at night which is unbearable when thousands are in your yard. This is the worst infestation since 1940 and $25,000,000 damage has been done to crop and range land totaling 1,500,000 acres in Central Utah. Previously, they never ventured out of the forest and ate mainly Sagebrush above 5000 ft. but lush fields of grain, mild winters and warm, moist springs caused a population explosion. They migrate in the daytime in large bands, 10 mi. wide, 60-100 individuals per sq. yd. They are voracious feeders and are always eating during the growing season from May-July. They eat everything in their path including other Crickets, bed sheets and vegetable gardens; they are selective and don't do much damage to lawns but they quickly turn yellow fields of grain into brown patches. According to Wakeland & Parker (1952), they feed on more than 250 species of range plants and on all cultivated crops they encounter; flower and seed parts are severely attacked. They consume 38 lbs. of forage per acre and cover 0.25-1 miles per day over all obstacles: mountains, trees and houses. They have large mandibles but do not bite. Females each lay 40-180 eggs, 1-1.5 in. deep in

dry ground, early in July. Then the Grasshoppers (Fig. 2) become a problem but at least you can eat Grasshoppers which are high in both protein and fat and are said to taste like Lobster. Indians herded Grasshoppers into trenches filled with bushes which were set on fire and the roasted Grasshoppers were collected. Indians also roasted salted Grasshoppers that flew over the Great Salt Lake, drowned and washed ashore. There was little mention of Mormon Crickets or Gulls in 1840. Cultivation started in July. 1847 and in the Cricket War of 1848, Mormons were losing the battle to the Crickets so they prayed. According to legend, wave after wave of Gulls descended, ate, regurgitated and ate again and saved the Mormons. It was called the miracle of the Gulls so a monument was erected in Salt Lake City to the Gull which was designated as the State bird. Each generation of bird or mammal must learn which insects are good to eat and which are bad. It is not instinctive. Usually, the first few individuals of a species to learn warn others which insects to avoid. Ed Bianco (personal communication) has occasionally observed a few Gulls eating the Crickets and found their remains in Gull stomachs early in a season. Gulls are scavengers and will eat anything from insects to dead animals and, like other birds, will gorge themselves when food is plentiful. Now, the favorite habitat of Gulls is the city dump but there were no dumps in 1848. Mormon Crickets were available and an easy source of food. They were regurgitated either because of a bad taste or because the meat was eaten and what was regurgitated was the exoskeleton; similarly, owls and hawks regurgitate pellets of mouse fur or bird feathers. It is said that Gulls have lost their taste for Mormon Crickets but I doubt if Gulls ever had a taste for the Crickets. When they were abundant in northeastern Utah in 1985, Romney showed them covering fields and bushes; Gulls were present but made no attempt to eat the Crickets. He found no evidence of any vertebrate feeding on them. In late spring of the early 1960's, Mammalogist Harold J. Egoscue of Grantsville, Utah (personal communication) encountered a large migration of Mormon Crickets crossing the Old Pony Express Route near Simpson Springs. Thousands of them had been crushed and large numbers and kinds of mammals and birds had congregated, including about a dozen Gulls of which some had Mormon Crickets in their beaks but no other species was observed eating the Crickets.

In 1848 Gulls had nothing to do with the decline of Mormon Crickets. They had completed their cycle; they had eaten, mated, laid eggs and were waiting to die. Pioneer Day on 24 July each year commemorates the Cricket War of 1848 when Gulls saved the Mormons but Cricket Day would be a more appropriate name as Mormons saved the Crickets by providing them with fields of grain. In 1940 the U.S. Animal and Plant Health Inspection Service (APHIS) used Arsenic as control. APHIS will spend $8,500,000 on Mormon Cricket control this year and next. They spread only enough poison for the Crickets to eat before the poison is eaten by other species. APHIS claims that they have used the poison for years with no trouble. Environmentalists stopped the program this year by threatening to sue because there are endangered species in the area and APHIS has no data on environmental impact. Control was completed only in about 20% of the infested counties so residents are trying to get the U.S. Congress to commit more funds for control. People in Oak City, near Delta, Utah were afraid to go outside as they

were covered with the Crickets that fell from house eves, roofs and trees; the Crickets were around the doors and all over the screens and rushed into houses when doors were opened. Mormon Crickets got into the source of drinking water, died and decayed and some poison got into the water. Was there a public health problem?

Acknowledgment

Grateful appreciation is expressed to K.S. Matz Graphics, Salt Lake City, Utah for electronic modification and rendition of Figs.1 and 2.

References

Romney, Steven V. 1985. An overview of a Mormon Cricket infestation in Northeastern Utah. Proc. Utah Mosq. Abate. Assn. 38-39:17-19.

Wakeland, Claude & J.R. Parker. 1952. The Mormon Cricket, 605-08, 1 fig., *in* Stefferud, Alfred (ed.). INSECTS THE YEARBOOK OF AGRICULTURE 1952. US Gov. Printing Office, Washington, D.C. xviii + 780 p., LXXII pl.

Fig. 1. Mormon Cricket, *Anabrus simplex* (Tettigoniidae), modified from Wakeland and Parker (1952).

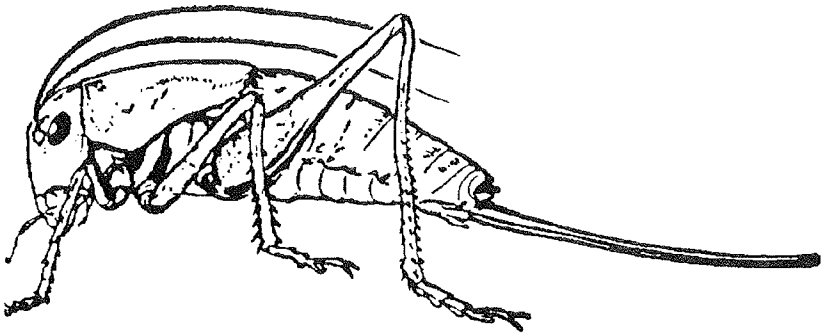

Fig. 2. Grasshopper, Zion National Park, Utah, reprinted with permission of editor S.L. Dickson from Elbel (1995). Proc. Utah Mosq. Abate. Assn. 48:29-32.

Aedes albopictus (Skuse) INTRODUCTION INTO SOUTHERN CALIFORNIA

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The Asian tiger mosquito *Aedes albopictus* (subgenus *Stegomyia*, and the Albopictus Subgroup which includes 12 species) is a common species in the Orient and Indomalayan regions. Isolated incidences of introductions into the United States (immatures breeding in tires returned from Southeast Asian ports) date back to 1946 (Pratt et al.). The first such introduction into California (Oakland), occurred in 1972 (Eads) when a few larvae and pupae (total of 5 specimens) were discovered breeding in used tires returning from Viet Nam. When this consignment reached Los Angeles, several more larvae and pupae were discovered. Since the number of mosquitoes encountered in these isolated incidences were very small they were soon contained at the harbor, preventing further spread. The first report of the establishment of a large population of *Ae. albopictus* in the U.S.A. occurred in 1986 (Sprenger and Wuithiranyagool) in Houston, Texas. The mosquitoes were found breeding in used tires shipped from Japan. Since then, this species has been sporadically introduced in similar shipments and populations have now established in 26 states east of the Mississippi River, and northwards into Illinois.

More recently, it was discovered that significant numbers of *Ae. albopictus* were being introduced in shipments of "lucky bamboo" (*Dracaena* spp.). Approximately 10-15 individual shoots of these plants are bundled together (totaling ~300) in each crate/carton containing 2-3 inches of standing water. Each maritime container (refrigerated at 22° C) holds about 500 crates/cartons of "lucky bamboo". These shipments originate from ports in southern China, and are delivered at 5 ports of entry into the U.S. (Los Angeles, San Francisco, Seattle, New York and New Jersey). This incident was first observed by staff of the USDA/APHIS/Plant Protection Quarantine (PPQ) station in west Los Angeles on July 7, 2001, as several adult mosquitoes escaped when the doors of a maritime container were opened for inspection. Several mosquitoes entered the inspection station and began viciously biting staff members. The PPQ facility was subsequently fogged with aerosolized insect "bombs" the same day. This incident was also brought to the attention of Michael Marty and Rey Fernandez, Officers in Charge at the CDC/Division of Quarantine (DQ), in west Los Angeles. Both Officers contacted Greater Los Angeles County Vector Control District (GLACVCD) in mid July, bringing with them a few adult mosquitoes for identification. The timely notification by the staff of the above mentioned agencies, revealed the significance of the introduction into California, of an important human pest

and a known efficient vector of several pathogens affecting humans. When it became obvious that we were dealing with an imported exotic vector mosquito, GLACVCD notified the Vector-Borne Disease Section (VBDS), California Department of Health Services (CDHS), and the Centers for Disease Control and Prevention (CDC)/Division of Vector-Borne Infectious Diseases (DVBID), Ft. Collins, CO. The CDC staff, Roger Nasci, Chester Moore, Duane Gubler (Director, DVBID), and Harry Savage provided on-going consultation. The CDHS/VBDS staff (Ken Linthicum and Vicki Kramer, Chief) coordinated statewide support.

The few specimens initially submitted to GLACVCD, were identified as *Aedes albopictus* by Mir Mulla, UCR, and subsequently, several adult and immature specimens were sent to CDC/DVBID Diseases, Ft. Collins, CO for species confirmation by Harry Savage, (taxonomist). Additional specimens were also forwarded to Tom Zavortink (taxonomist), University of San Francisco, who also confirmed the identification. There was concern that the possibility of introduction of other exotic mosquito species should not be overlooked, but none have been detected to date.

As the demand for "lucky bamboo" significantly increased, maritime containerized oceanic shipments in standing water, was initiated ~18 months ago (prior to this, "dry"/packaged, air-freighted shipments were usual procedure, but huge quantities proved to be an expensive proposition). After the arrival of the maritime containers at Los Angeles/Long Beach harbors, the containers are trucked to the USDA/APHIS/PPQ station in west Los Angeles for inspection. Following the discovery of the imported exotic mosquitoes, GLACVCD (at the request of USDA/PPQ and CDC/DQ) implemented a tentative control protocol: The maritime containers must be adulticided at the harbor, then trucked to the PPQ station and inspected within 24-72 hours following adulticiding. GLACVCD was fortunate to have the appropriate adulticiding equipment at hand, a fog-injecting device (the "L.A. Vector underground storm drain system Larvicide Applicator"). This fogging unit permits operational staff to inject the adulticide fog into the maritime container without "breaking" the seal of the container doors. The doors are opened just enough to "break" the first seal, the nozzle is forced through the second seal and SCOURGE® (18% Resmethrin + mineral oil) is injected. This assured that adult mosquitoes could not escape during adulticiding and when the doors were opened (~15-30 min. later) for inspection. Following inspection by the PDQ, when the wholesale nursery received the "lucky bamboo" shipment, GLACVCD staff larvicided all the crates/cartons of "lucky bamboo" with either VectoBac 12AS® or Altosid ALL® The wholesale nursery in the city of Rowland Heights (~20 miles east of downtown Los Angeles), was the first one to be inspected on June 22nd. Investigation by the GLACVCD staff revealed that many crates/cartons of "lucky bamboo" with standing water, were breeding mosquitoes. Adult *Aedes albopictus* were viciously biting staff during the investigation. The nursery employees "silently" complained of being viciously bitten during working hours. This was clear proof that Aedes albopictus was not only breeding on the premises, but free-flying adults were encountered at the nursery as well as in the immediate residential community (the first such incidence on the west coast of U.S.A.).

A nursery in Chinatown (immediately north of downtown L. A.) which, receives only air-freighted shipments of "dry" packaged bundles of "lucky bamboo", when examined, had mosquitoes breeding in the crates. This was clear evidence that the "dry" packaging also constitutes a problem, as the eggs of Ae. albopictus attached to the stems of this plant hatched when the plants were immersed in water.

To date (since mid June), GLACVCD operational staff, under the direction of Mike Shaw, has adulticided ~60 maritime containers, and have larvicided >5500 individual crates of "lucky bamboo."

Additional *Ae. albopictus* infestations at wholesale nurseries in other cities of L.A. County were subsequently discovered in the cities of Monterey Park and Alhambra, Collections from other counties included Chino (San Bernardino Co.) by West Valley VCD; Vista (San Diego Co.) by San Diego Co. EHD/Vector Surveillance & Control Program; Orange County VCD reported "isolated occurrences" in 2 retail nurseries (they received their supplies from the infested wholesale nursery in Rowland Heights and happened to transport ~2-4 larvae). Additionally, two infestations in northern California were discovered at wholesale nurseries in Gilroy by the Santa Clara Co. VCD, and in Lodi, by the San Joaquin County MVCD.

Aedes albopictus is an aggressive daytime biter. It is also known to be an efficient vector, and therefore, it is regarded as a significant potential public health problem in the U.S.A. (Moore 1999). Following consultations with the local agencies, the CDC/DVBID at Ft. Collins, in collaboration with the CDC/Division of Global Migration and Quarantine, Atlanta, GA (under the direction of Tony Perez, Div. Director and David Kim, Medical Epidemiologist) and the USDA/PPQ, enacted an *Embargo* [pursuant to Federal Law : 42 CFR 71.32(c)]. Future shipments of "lucky bamboo" *in standing water* will not be accepted at any U.S. ports effective as of July 17, 2001.

This species is a container-breeding mosquito which has adapted very well to breeding in a variety of man-made containers. Although frequent summer rains in southern California are not a normal occurrence, it is possible that the Asian tiger mosquito may establish itself in catch basins and/or underground storm drain systems, where the temperature and relative humidity are constant. In other metropolitan cities such as: Houston, TX, Memphis, TN, Tokyo, Japan and more recently in northern Italy (Celli, et al. 1994), *Ae. albopictus* has taken advantage of these environs.

Local vector control agencies in California are currently conducting surveys to determine the extent of infestations beyond the "focal points of infestation" (wholesale nurseries). Based on these findings, it may be possible to state perhaps by the spring or early summer of 2002 whether there are any signs of establishment by this species. If this is the case, it will prove to be a formidable challenge to attempt an effort to "eradicate" *Aedes albopictus,* because once this species has established in an area, records indicate that "they are there to stay".

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Gubler, CDC/DVBID; to Nabil Armanious, Tony Nakamura, Mike Bandiera and Ron Henderson, USDA/PPQ, west L.A.; Clifford Smith, Dianna Bowman and Brian Henderson, USDA/PPQ, Long Beach; Tom Zavortink, Univ. San Francisco; Michael Marty and Rey Fernandez, CDC/DQ, west L.A.; and to GLACVCD staff, Vector Ecologists Jacqueline Spoehel and Paul O'Connor, Operations Supervisor Mark Hall and his staff of Vector Control Specialists, especially Douglass Silva and Tom Tran.

REFERENCES CITED

Celli, G.R., R. Bellini and M. Carrieri. 1994. Survey on *Aedes albopictus* (Skuse) (Diptera: Culicidae) Infestation in Desenzano del Garda (Brescia Province-Italy). Boll. Ist. Ent. "G. Grandi" Univ. Bologna, 48:211-217.

Eads, R.B. 1972. Recovery of *Aedes albopictus* From Used Tires Shipped to United States Ports. Mosq. News. 32(1):113-114.

Moore, C.G. 1999. *Aedes albopictus* in the United States: Current Status and Prospects for Further Spread. J.Amer. Mosq. Control Assoc. 15(2):221-227.

Pratt, J.J., R.H. Heterick, J.B. Harrison and L. Haber. 1946. Tires as a Factor in the Transportation of Mosquitoes by Ships. Military Surgeon 99:785-788.

Sprenger, D. and T. Wuithiranyagool. 1986. The Discovery and Distribution of *Aedes albopictus* in Harris County, Texas. J. Amer. Mosq. Control Assoc. 2:217-219

The Utah Mosquito Abatement Association Website: Visitors and Recommendations

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The Utah Mosquito Abatement Association website

(http://www.umaa.org) is sponsored by Vopak USA's PestWeb (http://www.pestweb.com), an industry site. WebTrends (http://www.webtrends.com) provides monthly website statistical reports to the sites sponsored by PestWeb. These statistical reports provide a monthly snapshot of a website's audience – basically who visited what page when. The UMAA website experiences traffic everyday. An analysis of this traffic can provide valuable guidance on how to improve the site and increase the number of visitors.

How many visitors come to the site?

Table 1 summarizes general visitor statistics provided by WebTrends for July and August 2001. More than 2,000 unique visitors viewed at least one page on the UMAA website each month. Over 300 of these unique visitors returned to the website at least once for each month as well.
The best way to increase visitor traffic is to use the statistical reports to determine what attracts our audience.

What information do they access?

Tables 2 and 3 list the ten most visited pages on the UMAA website. Half the entries on each list are either papers presented during the annual meetings of the association or the title page for the published Proceedings. These papers and proceedings account for over 50% of all the page views for each month. Clearly, our audience uses the website to obtain specific mosquito control information – about diseases, vectors, vector control methods, chemical information, etc. This conclusion is strengthened by the fact that the third most requested page is a tool used by search engines to list webpages of a single topic.

How do they find what they want?

This question comprises two parts: which wepages refer to the UMAA website and what search phrases are used by our audience.

First, which webpages send our audience to us? From the results listed in Table 4, at least half of the top referring sites are search engines. This serves to further strengthen the conclusion that the public reaches our site while researching mosquito-related topics. This mosquito research can be supplemented by public education efforts separate from the internet. For example in July, KSL News was the 7th highest referring site. That month KSL published a news article on the appearance of *Aedes albopictus* in the South Salt Lake County MAD. This article

contained a link to the contact list of UMAA Officers & Mosquito Abatement Districts.

Second, what search phrases are used by our visitors? Table 5 lists the top ten phrases used each month. Many of our visitors find our website while researching other vectors and diseases. As we continue to provide industry specific information, our visitors will find the information they seek.

How can we help them?

Or, what recommendations can be made to improve the UMAA website?

First, I would strongly encourage all authors to submit their presentations at the Annual Conference for publication. The public researches mosquito-related topics on the internet and the inclusion of all papers would provide accurate information to all interested users and balance the UMAA website.

Second, UMAA officers and Mosquito Abatement Districts need to ensure their contact information is correct.

And third, the Annual Proceedings of the UMAA Conferences from 1990 on need to be published to the website to provide a library of information to users.

Table 1. General statistics summary.

	July 2001	August 2001
Hits	11,526	11,712
Average # of Hits per day	371	377
Page Views	4,089	4,068
Average # of Page Views per day	131	131
Visitor Sessions	3,608	3,576
Average # of Visitor Sessions per day	116	115
Average Visitor Session Length	00:02:04	00:02:28
Unique Visitors	2,389	2,447
Visitors Counted Once	2,027	2,129
Visitors Counted More than Once	362	318
Average # of Visitor Sessions per day (Monday - Friday)	122	122
Average # of Visitor Sessions during the weekend	180	189
Most Active Day of the week	Monday	Thursday
Least Active Day of the week	Saturday	Saturday
Most Active Hour of the day	12:00 pm 12:59 pm	10:00 am 10:59 am
Least Active Hour of the day	1:00 am 1:59 am	4:00 am 4:59 am

Table 2. Most requested pages for July 2001.

		# of Views	Average time viewed
1	*Distribution and Occurrence of the Aggressive House Spider in Utah* By Alan H. Roe, Utah State University, Logan, Utah (1994 Proceedings)	1,728	1:41
2	Welcome page http://www.umaa.org/	454	:40
3	Robots.txt (facilitator for search engines)		
4	*Hantavirus* By Dan Ariaz, Vector Control Environmental Health Science Division, Washoe County Health Department, Reno, Nevada (1994 Proceedings)	172	:16
5	Contact Information for UMAA Officers & Mosquito Abatement Districts	169	:50
6	Title page for the 1998 Proceedings	80	:43
7	*The Economics of Mosquito Control* By Judy Hansen, Cape May County Mosquito Extermination Commission, Cape May Court House, New Jersey (1994 Proceedings)	69	:27
8	*The Effects of Lunar Phases on Mosquito Light Trap Collections* By Sammie Dickson, SLC MAD & Gary L. Hatch, Davis County MAD (1994 Proceedings)	56	:16
9	UMAA Constitution	54	:39
10	May 2001 *News and Views*	53	:40

Table 3. Most requested pages for August 2001.

		# of Views	Average time viewed
1	*Distribution and Occurrence of the Aggressive House Spider in Utah* By Alan H. Roe, Utah State University, Logan, Utah (1994 Proceedings)	1,880	2:18
2	Welcome page http://www.umaa.org/	444	:38
3	Robots. txt (facilitator for search engines)	169	:25
4	*Hantavirus* By Dan Ariaz, Vector Control Environmental Health Science Division, Washoe County Health Department, Reno, Nevada (1994 Proceedings)	152	1:24
5	Title page for the 1998 Proceedings	92	1:03
6	*Dibrom Concentrate Results in Nevada, Utah and Idaho* By Pam Knoepfli, Valent USA Corporation, Sparks, Nevada (1994 Proceedings)	80	1:02
7	Contact Information for UMAA Officers & Mosquito Abatement Districts	74	:39
8	May 2001 *News and Views*	65	:57
9	*The Economics of Mosquito Control* By Judy Hansen, Cape May County Mosquito Extermination Commission, Cape May Court House, New Jersey (1994 Proceedings)	58	1:54
10	2001 UMAA Annual Conference Information Page	58	1:19

Table 4. Top referring sites.

	July 2001	August 2001
1	Welcome page http://www.umaa.org/	Welcome page http://www.umaa.org/
2	No referrer	No referrer
3	University of Antwerp http://www.ufsia.ac.be/	University of Antwerp http://www.ufsia.ac.be/
4	Big H Products, Inc (manufactures spider traps) http://www.hobospider.com/	Big H Products, Inc (manufactures spider traps) http://www.hobospider.com/
5	Search Engine http://www.google.com/	Search Engine http://www.google.com/
6	Search Engine http://www.google.yahoo.com/	Search Engine http://www.google.yahoo.com/
7	KSL News http://www.ksl.com/	Search Engine http://search.msn.com/
8	Search Engine http://search.msn.com/	Search Engine http://search.excite.com/
9	Search Engine http://search.excite.com/	Search Engine http://search.yahoo.com/
10	Search Engine http://search.yahoo.com/	Search Engine http://aolsearch.aol.com/

Table 5. Top search phrases.

	July 2001	August 2001
1	hobo spider	aggressive house spider
2	house spider	house spider
3	mosquito	hobo spider
4	aggressive house spider	dibrom
5	mosquito abatement	mosquito
6	mosquito trap	mosquito abatement
7	utah spiders	spiders in utah
8	hantavirus	abatement.com
9	southern house spider	southern house spider
10		hantavirus

Legal Constraints On The Collection, Possession, Propagation And Distribution Of Mosquito Fish

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Introduction and History:

Mosquito fish (*Gambusia affinis*) have been utilized throughout the world for mosquito control due to their efficacy in consuming mosquito larvae. Mosquito fish were successfully introduced in Utah from Selby County, Tennessee in approximately 1934. Since that time, the species has naturally and by human distribution established populations throughout the state. Their distribution, however, is limited to thermal springs and warm waters since the fish does not survive in cold water temperatures precipitated by severe winters. Utah mosquito abatement districts have collected and distributed mosquito fish throughout the state for many years to help control mosquitoes.

Although laws regulating the collection and distribution of aquatic wildlife in Utah have existed since the early 1900's, the laws' underlying purposes of disease and nuisance species control received heightened attention in 1991 upon discovering whirling disease in Utah. The devastating effect of the disease on wild trout populations and trout aquaculture facilities, combined with no effective treatment modality, brought fish health issues to the forefront of legislative attention. Stricter and more comprehensive laws were passed by the Utah Legislature controlling the propagation, possession, movement and distribution of aquatic animals to better protect wild fish populations and the aquaculture industry from the adverse effects of aquatic pathogens.

Regulatory authority over aquaculture and wild fisheries is divided between the Utah Division of Wildlife Resources and the Utah Department of Agriculture and Food in 1998, the Legislature created the Fish Health Policy Board to establish uniform statewide "policies designed to prevent the outbreak of, control the spread of, and eradicate pathogens that cause disease in aquatic animals." Utah Code § 4-37-503(1). In 1999, the Fish Health Policy Board established through the Utah Department of Agriculture and Food the *Aquaculture and Aquatic Animal Health Rule* found in Utah Administrative Code R58-17-1, et seq. The rule establishes a statewide program for the importation of aquatic animals into Utah, and for the registration and fish health monitoring of aquaculture facilities, fee-fishing facilities, public aquaculture facilities, public fishery resources, private fish ponds, and private stocking. Although both the Department of Agriculture and Food and the Division of Wildlife Resources have separate laws regulating aquatic animal activities under their respective jurisdictions, the *Aquaculture and Aquatic Animal Health Rule* sits as the cornerstone in fish health protection.

Mosquito fish are aquatic animals and therefore subject to the statutes and rules regulating the collection, possession, propagation, and distribution of such animals. To best understand the collage of laws regulating these varied activities, each will be discussed individually.

Collection and Possession:

Mosquito fish programs utilized by Utah mosquito abatement districts are primarily supplied with fish collected from wild sources. However, "[i]t is unlawful for any person to [capture, collect, or possess] any protected aquatic wildlife. . . in any of the waters of this state, except as provided by this code or the rules and regulations of the Wildlife Board." Utah Code § 23-15-7. "Protected aquatic wildlife" includes any species of fish, mollusks, crustaceans, or amphibians. Utah Code § 23-13-2(34). The statutory prohibition against capturing, collecting, or possessing "protected aquatic wildlife" combined with its expansive definition, leave little doubt that mosquito fish may only be collected or possessed in accordance with the rules and regulations of the Wildlife Board. The Wildlife Board and the Division of Wildlife Resources have promulgated the *Collection, Importation, Possession and Transportation Rule* found in Utah Administrative Code R657-3-1, et seq. which regulates, among other things, the collection and possession of fish in Utah. Collection and possession of all fish species, including mosquito fish, is strictly prohibited under the rule, except as authorized by the Wildlife Board through variance. Collecting or possessing aquatic wildlife in violation of these laws and is punishable as a Class B misdemeanor. Utah Code § 23-20-3.

Propagation:

Mosquito abatement districts that possess and *culture* fish in any pond, canal, stream, tank, structure or container are by definition, an aquaculture facility. As such, they are subject to the requirements and regulations of the *Aquaculture and Aquatic Animal Health Rule* (Utah Admin. Code R58-17-1, et seq.) as administered by the Utah Department of Agriculture and Food. Propagation is distinguished from mere possession by engaging in controlled cultivation of the fish. Controlled cultivation includes such activities as holding, feeding, propagating, and rearing the fish.

A few of the more pertinent regulations pertaining to aquaculture facilities are included in: Utah Code § 4-37-201 (certificate of registration from the Department of Agriculture and Food required before introducing fish to an aquaculture facility); Utah Code § 4-37-202 (facility may receive live fish only from health certified sources); and Utah Code § 4-37-501 (facility must receive annual health certification verifying the facility is free of pathogens). Health certification requires lethal sampling of at least 60 fish per tank or pond for disease testing with the test results showing the absence of any prohibited pathogen. The cost of testing is usually borne by the facility operator.

Distribution:

The efficacy of any mosquito fish program rests almost exclusively on a mosquito abatement district's ability to widely distribute fish each year into waters known to host mosquito larvae. Such a distribution scheme raises two serious issues: 1) introduction of pathogens by infected mosquito fish to

waters and aquatic wildlife not previously infected; and 2) introduction of a non-native fish species that may be detrimental to sensitive, native fish species.

To protect these interests, a variety of laws have been established prohibiting the transfer and release of live aquatic animals. See, Utah Code § 23-13-5 (unlawful for any person to import, possess or release from captivity any live wildlife without authorization from the Division of Wildlife Resources); Utah Code § 23-13-14 (Class A misdemeanor to release live aquatic wildlife back into the wild); Utah Code § 23-15-9 (unlawful for any person to transport or possess live protected aquatic wildlife); Utah Code § 4-37-105(1) (Division of Wildlife Resources and Wildlife Board are responsible for determining which species of aquatic animal may be imported and possessed in Utah); Utah Code § 4-37-111 and § 23-15-10 (aquaculture facilities and private fish installations may not be developed on natural lakes, natural flowing streams, or reservoirs constructed on natural stream channels); and Utah Code § 4-37-202(1) (transfer of live aquatic animals to any person or entity not possessing a certificate of registration to possess such animals is prohibited).

The clear message of these various statutes is that live aquatic animals may only be transferred to other people or released to the wild in compliance with applicable laws and with authorization from the proper regulatory authority.

Summary:

Mosquito fish distribution programs in the State of Utah have proven to be an effective tool in controlling mosquito populations in rural and urban areas. Such programs are particularly appealing due to their efficacy and non-chemical attributes. Due to these positive benefits, the Fish Health Policy Board, Wildlife Board, Department of Agriculture and Food, and Division of Wildlife Resources worked closely with several mosquito abatement districts along the Wasatch Front to develop a workable mosquito fish plan that addresses disease transmission and non-native species competition concerns without overly burdening mosquito abatement districts. The plan has been executed by agreement between many participating districts, the Division of Wildlife Resources and the Department of Agriculture and Food. The agreement, and compliance thereto, is the only means whereby mosquito abatement districts can obtain authorization to legally collect, possess, propagate, and distribute mosquito fish in Utah.

Notes:

The Department of Agriculture and Food is charged with regulatory authority over aquaculture facilities, fee fishing facilities, and out-of-state sources. An "aquaculture facility" is any tank, canal, raceway, pond, off-stream reservoir, or other structure used in the controlled cultivation of aquatic animals." Utah Code § 4-37-103(1) & (2). A "fee fishing facility" is a body of water used for holding or rearing fish for the purpose of providing fishing for a fee. Utah Code § 4-37-103(4). The Division of Wildlife Resources is charged with regulatory authority over public aquaculture facilities, private fish ponds, and the public fishery resource. A "public aquaculture facility" is any tank, canal, raceway, pond, off-stream reservoir, or other structure used in the Wildlife Resources, U.S. Fish and Wildlife Service, or an institution of higher education." Utah Code § 4-37-103(6). A "private fish pond" is a body of water where privately

owned fish are propagated or kept Utah Code § 4-37-103(5).

References Cited

Rees, Don M. 1934. Notes on Mosquito Fish in Utah, Gambusia affinis (Baird and Girard), Copeia 4:157 – 159.

TITLES OF ANNUAL MEETING PRESENTATIONS THAT WERE NOT PUBLISHED

AMCA In 2001 And Beyond
Sammie Lee Dickson

Integrated Mosquito Management
Henry Rupp

Arbovirus Update, 2001
Harry Savage

What's New In California
Karen Gramm

The Legislative Process And You; Welcome To The Future
Elizabeth Ann cline

Legacy Parkway
Todd Jensen and Rick Campagna

Serology Of Sentinel Chickens
Sharon Baldwin

Encephalitis Surveillance Report
Gary Hatch

Sex, Lies And Technical Advice
Joseph M. Conlon

How AMCA Publications Affect Operation
David Dame

Aerial Application With A New Formulation – Aqua Scourge
Sammie Lee Dickson, Brian Hougaard, Gary L. Hatch, Jing Zhai, David Sykes, and Bill Reynolds

Aerosol Droplet Size And Its Relationship To Adult Mosquito Control
James C. Dukes

Calibration And Optimization Using Vectobac 12 AS
Gary L. Hatch, Bob Mickle, and Peter DeChant

Improvements And Refinements In Electric Ground ULV Equipment
Steve Ingalls

Larvicide Resistance Management Protecting The MCD's Tool Box
Peter DeChant