Data Collection Protocols
Surveying for the Salt Marsh Harvest Mouse [*Reithrodontomys raviventris*}, California Vole (*Microtus californicus*) and Other Small Mammals

Random Sampling Protocol

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Non-random (grid-based) Survey Protocol

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Photo by W. Geissel

Introduction

The salt marsh harvest mouse (*Reithrodontomys raviventris*) (SMHM) is a small rodent endemic to the marshes of the greater San Francisco Bay and the Napa, Petaluma, San Pablo and Suisun Bay salt marshes. The salt marsh harvest mouse is considered to be a keystone species in tidal and brackish marsh habitats as SMHM populations succeed best in complete, healthy marsh ecosystems and decrease in numbers or are extirpated in human-altered marshes. Salt marsh harvest mouse populations are negatively affected by

factors such as the elimination of upland marsh habitat- areas that provide refugia during high tides (Shellhammer, 1989). Habitat destruction and modification since the early 1900's resulted in the U. S. Fish and Wildlife Service (USFWS) listing the SMHM as Endangered on October 13, 1970. The State of California followed suit on June 27, 1971 when the California Department of Fish and Game (DFG) granted the SMHM Fully Protected status. The listing of *Reithrodontomys raviventris* currently consists of two subspecies: *Reithrodontomys raviventris raviventris* (the Southern subspecies) and *Reithrodontomys raviventris halicoetes* (the Northern subspecies). *R. r. halicoetes* is found in Marin County, and throughout the Petaluma, Napa and Suisun Bay marshes. Due to the Federal and State listings and the paucity of information available on the biology of this organism, there is an active interest in determining and monitoring the current distribution of the SMHM within the species' historic range on state, federal, municipal and private lands. Both subspecies merit long-term monitoring because of their protected status, endemic character (Goals Project 2000) and potential for extinction over the long run. The subspecies of the California vole, *Microtus californicus sanpabloensis*, while not endangered is both endemic and a significant member of salt marsh ecosystems. Both species merit long-term monitoring because of their protected status and/or endemic character (Goals Project 1999) and in the case of the mouse its potential for extinction over the long run.

RANDOM SAMPLING AND NON-RANDOM SURVEY PROTOCOLS

Overview

Two small mammal live-trapping protocols are presented here. These two protocols were developed to survey a sampling universe consisting of diked, muted tidal, tidal salt, and brackish marsh habitats around the San Francisco Bay Area (a total of nine counties) and to specifically target a rare species (SMHM) as well as other rodent species known to occur in the brackish and tidal marsh systems. Both protocols can be transposed for use in other sampling universes (i.e. habitat types) even targeting more common small mammal species. T**hese protocols are not intended for trapping shrews, which requires other specialized techniques.**

The random sampling protocol was developed in order to create a standardized methodology which can test for presence/absence, stand up to scientific scrutiny, and also allow region-wide analysis of data sets obtained through both the regional monitoring program and surveys conducted by individuals from the public and private sectors. Approximately two days are required to complete setting up the random trapping arrangement, and the process of set-up is somewhat complex. The length of the trapping period, once the traps have been arranged, can be for a single trapping event (typically 4 nights) to determine presence/absence, or can be extended over a period of several weeks, months or years to answer other biological questions.

The random sampling technique is designed to determine salt marsh harvest mouse presence or absence at a given site, distribution, population size and abundance,

and to examine potential habitat and microhabitat variables (Padgett-Flohr 1999); thus providing detailed information on the habitats, distribution and current locations of the salt marsh harvest mouse around the San Francisco Bay Area. As new information from ongoing research becomes available on mouse habitat use, this survey protocol may require modification to include local variations in life history traits between the northern and southern subspecies of salt marsh harvest mouse.

The non-random trapping protocol ("grid" trapping in small regions within entire marshes) has been used historically and is the method still used today by most resource agencies. In use by mammalian ecologists over much of North America, the grid or non-random method provides a "snapshot" view of the portion of marsh (or other habitat type) contained within the survey grid. In practice, traps are arranged in a grid pattern within a habitat patch selected by trappers well trained in the natural history of the target species. The non-random method can provide valuable data about areas within grids that are judged a-priori as habitat. According to strict sample theory, however, the data cannot be extrapolated to places outside the grids because the grid locations are not randomly chosen. Choosing of a grid location based on professional judgment reduces the applicability of the survey results. For example, if the judgment about habitat is wrong, then the non-random approach might yield a false negative result; animals may be present within the site but absent from the grid location. The random approach distributes the sampling effort across the heterogeneity of habitat and thus can reduce some of the bias of presumed habitat preferences. This is important because the distribution of salt marsh harvest mice among habitat elements can vary among sites (Padgett-Flohr and Isakson *in press*). Usually a single day is required to complete setting up the trapping arrangement for the grid system, and the process of set-up is straightforward. The length of the trapping period, once the traps have been arranged, can be for a single trapping event to determine presence/absence, or can be extended over a period of several weeks, months or years to answer a narrow range of other life history questions for the area of the grid.

The choice of protocol will depend on time, money, and available personnel, as well as on the question being addressed. The non-random method may be most suitable for determining presence or absence in a fixed reference grid. In addition, constraints of selected tidal marsh habitats can cause trapping operations to be set up that follow neither protocol given here. For example, narrow bands of tidal marsh have to be sampled by setting traps along short transects parallel or perpendicular to the foreshore. The transects can be randomized, but the narrow patch is not conducive to typical grids. Customized trapping setups are usually the norm for very small or remnant marsh habitats.

Personnel

It takes a minimum of two people to set up the randomized regime and a minimum of one person to set up the grid regime; however safety concerns for target animals and trappers in the highly urbanized Bay Area generally warrant the use of two or more people to set up trap arrays and conduct trapping operations.

Permits

Trapping for the SMHM requires possession of a current Section 10A permit issued by the USFWS, a current Memorandum of Understanding (MOU) with DFG and a current Scientific Collecting Permit also issued by DFG which reflects the conditions of the 10A permit. Lead trappers should be permitted to ear-tag salt marsh harvest mice.

NOTE: Permitting for the two subspecies [*Reithrodontomys raviventris raviventris* (the Southern subspecies) and *Reithrodontomys raviventris halicoetes* (the Northern subspecies)] is a process independent of each other. All permits must reflect both subspecies or, the trapper may only trap in areas where the subspecies for which they are permitted, is known to occur.

All field assistants who will be touching traps for the purpose of baiting, insulating and/or setting them must be listed on a current Section 10A permit and MOU (J. Gustafson DFG, personal communication), which do not necessarily need to be associated with the lead biologist conducting the trapping.

Individuals who are not listed on any permits as either principal investigators or field assistants, are allowed to assist with other activities associated with setting up the sample area, such as flagging and numbering trap sites. It is recommended that all persons involved in trapping operations be in possession of a current California Scientific Collecting Permit.

Sampling Universe, Sites, Strata, and Units

The sample universe for either protocol encompasses the tidal marshes of the San Francisco Estuary. Sample sites are wetland projects or other patches of tidal marsh. The primary strata are the high marsh plain and backshore. These main strata include many lesser habitat elements, such as levees ad channels margins, that can be of special interest at some sites.

The USFWS does not currently have a standardized protocol for determining population densities due to the lengthy trapping periods required, habitat complexity of sites to be sampled, and the extreme variations in population numbers at occupied sites. Therefore, (regardless of the protocol chosen), for comparisons between sample sites, the accepted unit of population size is "catch-per- unit-effort." The unit of effort is the "trap night." One trap operated for one night = one trap night (TN). The "catch" is whatever species you are trapping (which, for example, could be: 1 SMHM caught in 100 TN = 0.01 SMHM per unit effort). Use of these units allows for comparisons between sites for which data were obtained using similar trapping methodologies.

Protocol for Random Sampling

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This protocol involves completely randomized sampling regime to determine absence-presence, microhabitat preferences, rodent movements within entire marshes, population distributions across a marsh, changes in distributional patterns, temporal changes and other ecological questions depending on the length of time a study site is sampled. This sampling technique has inference limits as large (or small) as the sample area; if the randomized points are scattered across an entire marsh, conclusions can be inferred about the entire area.

Timing

Approximately two days are required to complete setting up the trapping arrangement, and the process of set-up is somewhat complex. The length of the trapping period, once the traps have been arranged, can be for a single trapping event to determine presence/absence (typically 4 nights), or can be extended over a period of several weeks, months or years to answer other biological questions.

Seasonality

If presence/absence of the SMHM is the only question to be answered, then this protocol may be used and trapping is merely conducted for a single event. For this type of question it is best to focus on trapping during peak recruitment, which is generally late spring-early summer depending on the site's location around the San Francisco Bay.

For studies of habitat and microhabitat preferences, as well as other more complex research questions, an extended period of trapping is needed. Since SMHM populations change in distribution over time and the distribution is not always patterned, surveys should be carried out over a minimum of a four-month period between April-July with one sampling event each month. This will allow investigators to detect patterns of distribution and changes over time as-well as any statistically significant associations between SMHM presence and any given correlate (Padgett-Flohr and Isakson *in press*).

Analysis

Depending on the type of question being asked, the timeframe involved, and/or variables being tested, a number of different statistical tools are available. Random sampling lends itself to a wide number of tests in particular the Principal Components' Analysis ("PCA") and the multi-way Loglinear Analysis.

Recommended Sample Size

According to the standards of current biostatistics (Zar 1994) a minimum of 30 sample points is required to conduct valid biostatistical analyses. This means that a minimum of 30 trapping locations is needed. However, with a rare species like the SMHM it is prudent to increase the sample size to increase the likelihood of capturing animals. The primary limiting factors here are the time constraints articulated in the conditions of the federal permit as they pertain to SMHM. For other small mammal species (e.g. California meadow voles) the number of sample points is limited by the trappers' ability to get to all the locations and obtain the data in a reasonable length of time, posing no risk to the target species, and meeting budgetary constraints. One way to increase the number of sample points being surveyed without any jeopardy to animals or humans is to team up trappers, rather than having a single trapper survey an area.

Trapping salt marsh harvest mice is challenging for many reasons, not the least of which is the time constraint imposed on the trapper by the Federal Endangered Species Permits issued by the USFWS for *Reithrodontomys raviventris*. As articulated in the Conditions of the Section 10A permit, all animals must be released within one hour of sunrise. This condition limits the number of traps one trapper can process and also limits the area the trapper can effectively cover. Therefore the initial task in setting up a random sampling scheme at any given locale is to determine the size of the area of interest. In past research conducted in a muted tidal marsh ~300 ha was found to be the maximum area one trapper could cover using random sample points (Padgett-Flohr *in press*); however this is subject to a certain amount of site-specific modification as access within each marsh system will vary. If access within the marsh is unrestricted as is frequently the case in diked marshes, then the area can be enlarged; if access if very difficult as is the case with tidal marshes, then the area may need to be reduced. If the sample area is large (>300 ha) then it may be subdivided and random sampling conducted within each subdivision. If a site is extremely large then subdivisions can be randomly chosen for random sampling within those subsets.

Obtaining Random Sample Points[1]

Photo-map

Once the sample site has been identified, a photo-map of the area must be procured. The photo-map must be of sufficient resolution (approximately a 1:1000 scale) to allow the creation of a grid overlay that demarcates the site into ~50m X 50 m blocks. The Digital Orthoguadrangles (DOQs) produced by the USGS are sometimes suitable, although they may be outdated for some sites. The following procedure has proven useful.

> Starting with the appropriate USGS 7.5" topographic quadrangle ("quad"), divide the quad map into quarters (NE, NW, SE, SW). Identify which quarter(s) of the quad the sample area is located in. Contact the Eros Data Center (http://edcwww.cr.usgs.gov/eros-homc.html) with the information (name of topographic map, appropriate quarters and co-ordinate system)

[1] This only needs to be done once for each site- the points then become permanent sampling points.

and purchase the required photos[2]. Once the photos are obtained it will be useful to make some inexpensive copies that can be marked upon.

Creating the Grid Overlay and Random Sampling Points

A GIS can be used to generate the grid and to randomly select from it the sample stations. The following procedure can be used in the absence of a GIS.

Draw a grid over the photo-map of the survey area, such that each cell of the grid is approximately equal to a 50m x 50m area on the ground. The size of the cells is subject to a certain amount of flexibility, since some sample areas may be smaller than 300 ha and the block sizes will then need to be somewhat reduced. When drawing the grid overlay, orient the grid lines north-south and east-west in order to simplify the task of locating sample locations and compass bearings in the field. Number each block on the map and then conduct a random draw to identify 40 blocks as sample locations. Denote on the map which blocks will be sample locations and calculate the compass bearings of the grid lines (N, S, E and W)

Transferring Sample Points from Paper Map to Sample Site

To conduct the transfer, field personnel will need a rangefinder, compass, binoculars, inflatable boat with oars, neon flagging, (reflective flagging is also useful), and permanent markers. Walkie-talkies are convenient but optional.

This process requires a minimum of two people. In the absence of a GPS, a team of three people is preferable. The following procedure can be used to locate the sample blocks without a GPS.

One person to be the "traveler." This person is directed by the other two individuals to each designated sample block and will place flagging such that the sample point and the route to the point will be easy to find during the trapping period. The traveler will uniquely number the flag of each sample block. A second person consults the compass and directs the traveler along the designated compass bearing, which was taken from the original gridded map. (If there are only two people, the traveler will need to read his/her own compass as they walk-- maintaining the bearings calculated from the map). The third person (or second person if there are only two individuals) measures the distance the traveler has walked using the rangefinder, indicating when the traveler needs to stop to set a sample point. If the grid blocks are 50m x 50m blocks, then the traveler will walk in increments of 50m as directed by the distance reader.

Example: The procedure begins in one corner of the sample area. For this example the southwest corner is the start point and blocks are 50m X 50m. Using the rangefinder or a measuring tape, first locate the traveler in the

[2] The price is $50.00 for the first file and $7.50 per quarter thereafter.

middle of the most southwest block- (e.g. if blocks are 50m x 50m then the traveler will need to walk 25 m east and 25 m north to locate him/herself in the middle of the first block). This beginning point is important because the other locations will be calculated from here. The compass reader and the distance person then align themselves with the traveler such that the compass person can direct the traveler along the proper compass bearing and the distance reader can determine when the traveler has walked the appropriate distance to end up in the middle of the next block. The blocks can then be "leap-frogged" in this manner, by the traveler walking in increments of 50 m along the appropriate compass bearing until a designated sample block is reached. Depending on the maximum detectable distance of the rangefinder being used, the distance and compass readers will need to move forward and catch up to the traveler, once the traveler has reached the maximum distance the rangefinder can read. Once the distance and compass readers reach the spot held by the traveler, the traveler can then resume walking.

Note: Starting in one corner does not mean that all sample blocks must be determined from that point. The process can be repeated from all four corners (using the compass bearings calculated from the map), which can make the traveler's job a bit easier. Areas of channels and sloughs that cannot be negotiated on foot will need to be crossed using inflatable boats. The inflatable boats can easily be carried across vegetated areas.

Once all sample points have been located and conspicuously flagged AND the routes to the points flagged as well, transfer all information (including the routes) to a fresh copy of the photo-map. It is advisable to make multiple copies of this final map and to have those copies laminated for use in the field.

Timing and Seasonality

The window for sampling will vary according to the condition of the sample site. Tidal areas should not be trapped during times when high tides cover the marsh plain. Fr sampling the plain, it is best to conduct the sampling at the end of a neap tide series, when mice and other small rodents that might be subject to trapping have had time to re-occupy the plain after its repeated tidal inundation.

Trapping Specifics [3]

At the center each of the sample blocks, three traps should be situated in a triangle configuration, with traps placed 5m apart. The maximum number of traps that can be processed within USFWS Section 10A permit time constraints is about 120 traps per trapper. Sampling continues for six nights following the conditions of the trapper's federal permit.

[3] Salt marsh harvest mouse trapping must be carried out by a trapper permitted by the USFWS and all field assistants who assist in setting traps must be listed on a permit.

Section 10A Permit Conditions

?? All traps should be set within 1-2 hours of sunset and all animals need to be released at the point of capture within an hour of sunrise.

?? Traps should be supplied with 100% cotton (100% cotton is easily obtained in large sheets at fabric stores in the batting section of the quilting supplies; the clerks will even order it in large quantities for customers). In addition, the traps should be provisioned with wild birdseed and English walnut meats.

Protocol for Non-random Survey

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Introduction

This protocol was developed for surveying diked, muted tidal and tidal salt and brackish marsh habitats around the San Francisco Bay Area. It is a standard survey method for determining the presence or absence of target small mammal species. It can also be used to monitor status and trends in small mammal populations within the areas surveys.

Two small mammal live-trapping protocols are presented in this document (see the random sampling protocol above prepared by Gretchen Padgett-Flohr). The choice of protocol will depend on time, money and personnel available, as well as the research question being addressed. Currently there is no standardized protocol for determining accurate population densities due to the lengthy trapping periods required, habitat complexity of sites to be sampled, and the extreme variations in population numbers at occupied sites. Therefore, for comparisons between sampling points, the accepted figure to represent the population is the "catch-per-unit-effort". The unit of effort is the "trap night". One trap operated for one night = 1 trap night (TN). The "catch" is whatever species you are taking data on (which, for example, could be 1 salt marsh harvest mouse (SMHM) caught in 100 TN = .01 SMHM-per-unit-effort).

The non-random or grid method presented here is the one used by most professional consulting firms and government agencies because of limitations of time and money. It has been used for almost all consulting and research trapping up through the present time. Due to recent advances in biostatistics, this method is now generally considered useful only for presence/absence data. The grid or nonrandom method is, in essence a "snapshot" of the portion of a site that is included in the sample grid.

According to this method, traps are arranged in a grid pattern within a portion of a site that is judged to be suitable habitat. The data are only applicable to the area of the grid and cannot be extrapolated to other areas at the sample site or to other sites. Auto-correlation over time within the fixed grid reduces the value of data for comparing one site to another. However, wetland managers are frequently most concerned with the presence or absence of a target species, and non-random trapping within areas that seem most suitable as habitat for the species can meet the managers' information needs.

Survey Procedure\

Condition of Salt Marsh Harvest Mice and Other Small Mammals

This procedure requires much understanding of the natural history and habitat preferences of the target species. While volunteers can assist with trap deployment and the checking of traps, a professional wildlife biologist with abundant knowledge of the target species is required to choose the location s of the traps.

Only 1 day is usually required to complete setting up the trapping arrangement for the grid system, and the process of set-up is straightforward. The length of the trapping period, once the traps have been arranged, can be for a single trapping event to determine presence/absence, or can be extended over a period of several weeks, months or years to answer a narrow range of other life history questions. However, safety concerns for target animals and trappers in the highly urbanized Bay Area sometimes warrant the use of two or more people for trapping operations.

A 10-meter interval between traps is used for most small mammals, especially salt marsh harvest mice. Grids of 50 or 100 traps are common. It is difficult for one trapper to handle more than 100 traps and meet the requirements spelled out in federal permits for the salt marsh harvest mouse. Different professional trappers and scientists trap for different numbers of consecutive nights. A four-night trapping period is common. Experience has shown that this level of effort provides adequate assurances that zero counts mean the harvest mouse is absent from the grid. The USFWS sometimes stipulate longer survey periods.

Handling Mice and Data

All salt marsh harvest mice captured are measured and inspected using the following procedures.

Marking Individuals: Individual identification of salt marsh harvest mice can best be made by ear-tagging the animals with uniquely coded fish-fingerling tags. The use of ear tags is by permission of the USFWS and CDFG personnel. Animals can be blazed (i.e., a small bit of terminal hairs can be cut off to reveal a pattern of darker fur) but permission to blaze animals is again up to the permitting agency, and the technique does not allow for the identification of many animals in any one population.

Phenological traits are reasonably useful but not fool-proof in the identification of individual salt marsh harvest mice. Other species of small mammals can be identified much more easily.

Measurements of Harvest Mice: The following key traits described by Fisler (1965) and Shellhammer (1984) should be recorded on standardized data sheets, as should behavioral observations. Weights should be taken on the first capture of each animal and then every time it is captured or recaptured if there are concerns that captures and handling is affecting body weight. Obvious immature salt marsh harvest mice of very low weight (about 8 grams visually estimated) should be released at once to avoid the additional trauma of handling them. Capture/recapture status and reproductive condition should be recorded.

Tail Traits of Harvest Mice (after Fisler, 1965 and Shellhammer, 1984)

Characteristic	**Score**		
	0	1	2
Tail tip	Blunt	Intermediate	Pointed
Color pattern of tail	Unicolored	Intermediate	Bicolored
Hair color on venter of tail	None	Few	White Hairs
Diameter of the tail - 20 mm from the base of the tail.	$\geq$2.1	2.0	$\leq$1.9

Total score 0-3 salt marsh harvest mouse
4-5 unidentifiable
6-8 western harvest mouse (*R. megalotis*)

The behavior of salt marsh harvest mice (active, intermediate, placid) should be recorded as behavior. The tail/body ratio (See Fisler. 1965) are also helpful in identifying harvest mice when used in conjunction with tail traits. Salt marsh harvest mice are usually placid while western harvest mice are usually very active. Western harvest mice tend to bite; the salt marsh harvest mouse doe not.

Habitat Data: Describe the general vegetation of the overall area of the grid and how the grid(s) are positioned within the general area. This general description and the following plant characterization become increasingly important when trapping in marginal habitats for the species, especially the salt marsh harvest mouse. Beginning at one corner of the grid, and using the trap as the center of a 1-m^2 plot, measure the height of the tallest plant, the percent cover of each plant species, and the amount of bare ground within the plot. Continue these measurements at every second trap throughout the grid.

If trapping is conducted in an area where California deer mice (*Peromyscus maniculatus*) are present, Hantavirus precautions will need to be taken during trapping (i.e. use of gloves for handling rodents). At the conclusion of any trapping, all traps must undergo a decontamination wash using a bleach solution.

Permits

A Federal Collecting Permit and a Memorandum of Understanding with the California Department of Fish and Game are required to trap and handle any protected species including the harvest mouse and vole. There are more detailed requirements presented in those documents than in this protocol. A California Collecting Permit is also required by the CDFG.

Timing

The Sacramento Office of the USFWS must be contacted before any trapping activity for permission to trap. Trapping is most likely to produce positive results when carried out between May 1 and November 1. Trapping in the late Fall, Winter or early Spring will result in reduced likelihood of capturing the protected rodents, especially the Salt marsh harvest mouse, and trapping then increases the risk of greatly stressing and possibly killing salt marsh harvest mice. Trapping during this period of the year should be avoided unless requested by the USFWS.

Frequency or Interval of the Sample

Areas are usually surveyed once, but repeated surveys can be done if indirect estimation of change in "density" (i.e., capture effort) is considered appropriate. Traps are usually set a 10-m intervals in square grids for four nights. Grids of 100 traps (i.e., 10 x 10 grids) are common. The grid may be elongated (e.g. 1 traps x 100 traps in narrow fringe marshes), but the variance of the survey increases as the grid becomes less square.

Federal trapping permit guidelines prescribe closing and opening times of the traps, usually they are closed no sooner than one hour before sunset and opened and checked no later than one hour after sunrise.

When trapping on a tidal marsh plain, trap placement and removal each day must fall between inundating tides. Most permits require notification of the USFWS/Sacramento Office if any trap deaths occur and temporary stopping trapping until completion of consultation with the Service in that case.

Equipment

"Sherman" or similar type live traps are used and usually are placed in an equal-sided grid (i.e. 10 traps x 10 traps).

Traps must be provided with cotton and birdseed and/or walnut meats and covered with vegetation to prevent excessive heat loss during the night. Traps must be

placed above the highest high tide line when trapping during spring tides or at any other tome when the high tides inundate the marsh plain.

Units of the Data

The units of data are the confirmed presence/absence of various species of small mammals and some indication of relative numbers using catch-per-unit-effort.

Recommended Sample Size

The number of grids per area and the size of the grids vary accordingly to the needs of the client, investigator or agency. The area to be trapped may be enlarged by running another grid adjacent to it for an additional four days or other period of nights. Very low to zero captures of the harvest mouse or voles, depending on the goal of the trapping, poses the problem of whether zero captures truly means that none of that species is present. This possibility can be further tested by trapping the same grid for an additional four nights starting a week after the first trapping. While trapping this additional four nights is unlikely to produce a result that is 95% certain that no mice are present, it does greatly increase that likelihood.

Recommended Format of the Field Record

Data sheets should include the following minimum items: sex, location of trapping area, body length, tail length, tail/body ratio, weight of the animal in grams, testis state if male (descended or not), pregnant or lactating is a female. Tail characteristics as taken from Fisler (1965) and Shellhammer (1984) as to (1) tip of tail (pointed, intermediate, or blunt), (2) pattern of tail (bicolor, intermediate, or unicolor), (3) ventral tail hairs (white, intermediate, or not white) and (4) diameter of the tail at 20 mm from the body (usual range listed is from 1.8mm to 2.8mm).Behavior of animal (active, intermediate or active). The color of the venter of the animal should be noted using Fisler's (1965) scheme: (1) white, grayish white, (2) cinnamon pectoral spot, (3) band of color across venter [chest], (4) ventral band of color, ¾ of venter white, (5) venter a mixture of color with ½ white, (6) trace of white, (7) venter all cinnamon or buff of varying intensity. A chart should be provided for dates of capture, stake number and a description of the vegetation at those stakes. A section for comments should be provided. A line or block should be provided for the diagnosis as to whether the mouse is a western, salt marsh or "intermediate" harvest mouse.

Analysis and Presentation of Data

The analysis is straight forward. The results are presented as the number of species and number of individuals of each species trapped. That data re also presented for each species in units of capture effort (i.e., catch-per-unit-effort). Data are presented in tables.

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