Mireille Chabot Halley
Fish Springs NWR
Dugway UT 84022
(801) 831-5353

INVERTEBRATE SAMPLING AT FISH SPRINGS NATIONAL WILDLIFE REFUGE

Abstract: Fish Springs National Wildlife Refuge (FSNWR) conducted annual invertebrate sampling from 14 July to 5 Aug 1997. Waterboatmen (Family Corixidae) and Backswimmers (Family Notonectidae) were the most common species and were 47% and 26.7 % respectively, of the total invertebrates found. Peak abundance was found in Pintail Unit. Peak diversity was found in Gadwall unit which had 9 species. Shoveler Unit had the lowest diversity and abundance.

Keywords: Diversity, Food, Invertebrates, Nutrition, Waterfowl

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Fish Springs has the opportunity to provide high quality, preferred habitat to waterfowl and wading birds such as gadwall (Anas strepera), canvasback (Aythya valisineria), white faced ibis (Plegadis chihi), and snowy egret (Egretta thula) consistently from year to year through a nearly constant supply of water that is virtually unaffected by annual and seasonal fluctuations in precipitation. Many birds such as ducks and geese are dependent on high protein invertebrates for successful raising of young (Kaminski and Prince 1981, Murkin and Kadlec 1986, McKnight and Low 1969). Krapu and Swanson (1975) found that plant foods contained insufficient amounts of calcium for reproduction of pintails, and presumed that invertebrates, especially snails would become the primary source of calcium during the laying season.

Drawdowns simulate the cyclic drying and flooding of natural wetlands causing a release of nutrients tied up in emergent vegetation. Burning of stands of emergent marsh vegetation also aids this process (Faulkner and de la Cruz 1982 and Smith and Kadlec 1985). This sudden

release of nutrients and re-flooding has been shown to cause an increase in the diversity and abundance of invertebrates (Kadlec 1962).

The purposes of this study are to: 1) Quantify the abundance and diversity of invertebrates in the various marsh units; 2) Determine the success of marsh management strategies such as drawdowns and prescribed burning in increasing abundance and diversity of invertebrates; 3) Describe the distribution pattern, if any, of invertebrates in the Fish Springs marsh.

STUDY AREA: The study was conducted at Fish Springs National Wildlife Refuge, located at the southern end of the Great Salt Lake Desert in Juab Co., Utah. Large temperature variations occur both daily and seasonally as is typical of desert environments (Butcher 1976). Annual precipitation averages 8 inches (J. Banta, USFWS. pers.commun.). Nighttime low temperatures during the study ranged from 53° to 72 ° F (F. Banta, USFWS. pers. commun.). Marshes are flooded with a steady supply of alkaline spring water. Water is diverted by Refuge personnel through a series of culverts to each marsh unit. Normally, two of the marsh units are drained and burned each year. In this rotation each unit is burned every six to seven years. Burning and re-flooding usually takes place in the fall. Traps were placed in areas with at least 1m of water depth. Vegetation was submerged and included muskgrass (Chara sp.), widgeon grass (Ruppia maritima).

METHODS: Light traps were constructed using a sun tea jar, funnel and a 6 volt flashlight (Figure 1). All flashlights were equipped with new batteries each evening to ensure constant and even illumination of all units surveyed. Bulbs were replaced when a bulb decreased in light intensity. The traps were inverted, filled with water and attached to posts in the ponds so that at

least half of the jar was submerged. Two traps were placed in each pond, one at the eastern and one at the western end. Trap poles are left in place year after year and are only replaced in the event of one being knocked over, as sometimes happens during winter due to ice and wind. When poles are replaced the same location is found using the fallen pole or the map included in the 1993 invertebrate study. Care was taken to maintain 1m of water depth at all sites. Evenings when there was >50% cloud cover or chances of storms, trapping was delayed to the next clear evening. The traps were set up, and the lights were turned on at dusk. Samples were collected the following morning being careful to not spill any of the invertebrates. Specimens were strained with a .833mm mesh strainer and placed into pint canning jars with isopropyl alcohol. Specimens were counted and identified to family or to the most certain taxonomic level (Table 3). In this study all visible parasitic and free swimming invertebrates were counted, except for the too numerous to count copepods. Notes regarding the relative abundance, or absence of copepods were made before the samples were strained.

RESULTS: Shoveler Unit had the lowest abundance and diversity of any unit. Gadwall Unit had the highest species diversity. Pintail Unit had the highest invertebrate abundance of any unit (Table 1). Five units had eight of the nine invertebrate species found, only one unit, Gadwall, had all nine species. The other three units had lower diversity numbers (Table 2). Copepods were observed and estimated as absent, present, abundant and very abundant. The samples from Harrison Unit had copepods so very abundant that they clouded the water and also formed a viscous appearing layer on the bottom 2 inches of the trap jar. Copepods were not found in the samples from Mallard, Curlew, and Gadwall Unit.

DISCUSSION: During the period of egg formation duck hen diets are 70 - 99% animal matter (Brookhout 1979). This increase in animal matter delivers necessary protein, calcium and amino acids for egg production (Krapu 1979). Chura (1961) determined that the bottom dwelling insect family Chironomidae comprised the bulk of animal food ingested by mallard ducklings and that F. Corixidae formed a large portion of the diet of mallard ducklings at Bear River Migratory Bird Refuge. At Fish Springs Corixidae were 47% of all invertebrates caught. No Chironomidae were captured in this sampling nor in any of the other years' except in 1983. In 1983 F. Chironomidae were 42% of the total invertebrates collected. Samples that year were collected from the bottom using an Eckman dredge rather than the current light trap which does not sample the substrate. Many large swarms of adult Chironomidae were observed this summer so it is likely they were present and simply not detected due to the equipment used.

Harrison Unit had good abundance and diversity as was expected due to it's burning this year. Shoveler Unit had the lowest diversity and abundance. It was burned in 1995. This is unusual and may be an artifact of our one night sampling design. A compairison of the long term data show that more often than not, increased invertebrate abundance follows a drawdown and burn (Tables 4 and 5).

Based on data from the 1996 invertebrate study I expect that copepods will disappear from Egret Unit and decrease if not disappear from Avocet and Pintail Unit. Harrison Unit's population of copepods is most likely to decrease as they must be near carrying capacity.

One representative of a non-aquatic family (Curculionidae) was found.

Continue marsh management strategies that would protect and enhance the diversity and abundance of invertebrates that are beneficial to breeding birds.

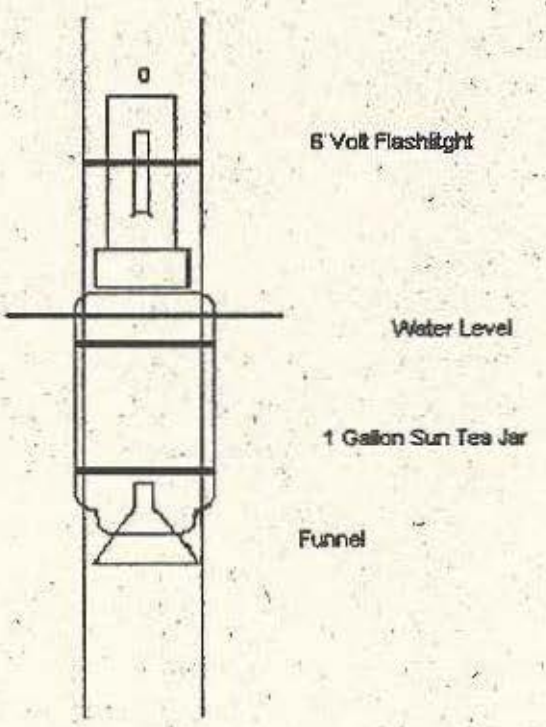

Figure 1: Light trap apparatus used to capture invertebrates at Fish Springs NWR.

Table 1: Total invertebrates collected by invertebrate sampling at Fish Springs National Wildlife Refuge, July 1997.

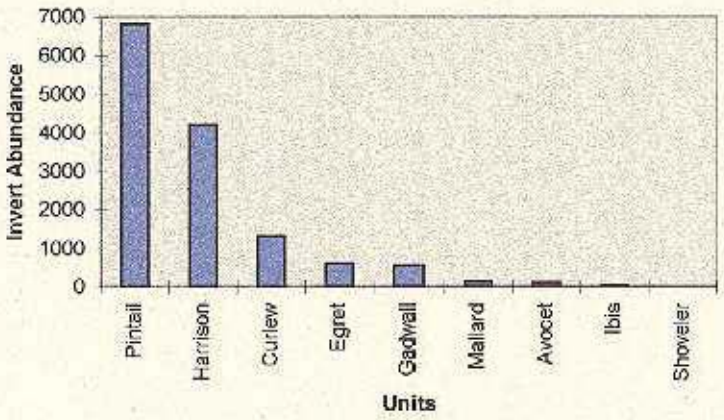

Table 2: Number of species captured in each unit during invertebrate sampling at Fish Springs National Wildlife Refuge, July 1997.

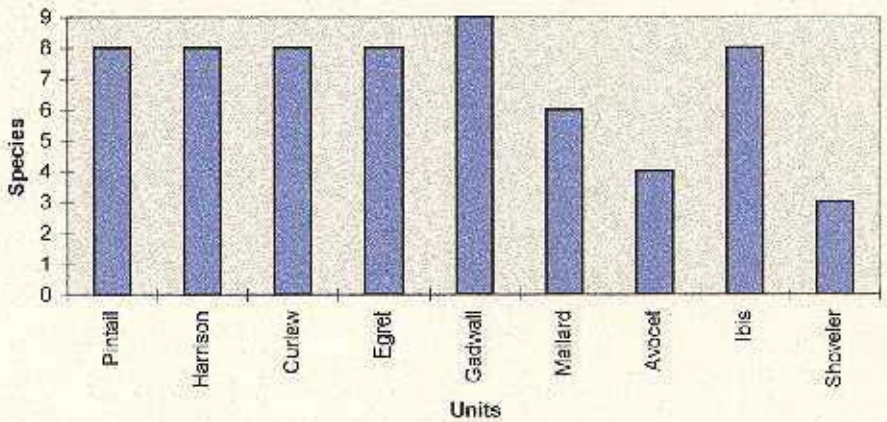

Table 3: Species breakdowns of invertebrates captured at Fish Springs NWR, July 1997.

	UNIT									species	species
	Mallard	Curlew	Ibis	Gadwall	Avocet	Shoveler	Pintail	Harrison	Egret	TOTALS	% of grand total
Waterboatmen	15	336	1	54	13		3746	1713	164	6041	47.0%
Family Corixidae											
Backswimmer	55	37	3	51			2291	915	83	3435	26.7%
Family Notonectidae											
Grey Water Mites	48	2	1	0	80	2	2	27	35	197	1.5%
Family Acarina											
Red Water Mites	9	10	2	0	4	2	443	54	49	573	4.5%
Family Acarina											
Crawling Water Beetle	1	0	27	20		2	237	360	232	879	6.8%
Family Haliplidae											
Predaceous Diving Beetle		0		1			15	437	23	476	3.7%
Family Dytiscidae											
Mayfly		1		20						21	0.2%
Family Ephemeroptera											
Damselfly	1	2	3	119	3		79	160	3	370	2.9%
Sub-order Zygoptera											
Dragonfly		1		305			2	538	5	851	6.6%
Sub-order Anisoptera											
Weevil		0		1						1	0.0%
Family Curculionidae											
Leech		1								1	0.0%
Order Annelida											
Copopods					A	VA	A	SA	A		
Unknown			A								
totals	129	389	37	571	100	8	6815	4204	594	12845	100%
% of corixidae in total per unit	12%	86%	3%	9%	13%	0%	55%	41%	28%		

A = Abundant
VA = Very abundant
SA = Super abundant

Table 4: Long term data compairison of invert abundance at Fish Springs NWR.

Unit	1990	1991	1992	1993	1994	1995	1996	1997	Avgs	Totals
Mallard	79	d	174	56	214	158	341	129	164	1151
Shoveler	5588	141*	17	33	41	d	676	6	1060	6361
Pintail	3885	158*	887	830	2442	d	1622	6815	2747	16481
Harrison	d	4296	8137	1147	d	26961	68103	4204	18808	112848
Curlew	181	417*	d	126	d	638	149	389	297	1483
Ibis	d	2908	d	1618	d	5876	3329	37	2754	13768
Gadwall	d	d	d	d	d	d	17895	571	9233	18466
Egret	d	808*	d	94	697	1327	1982	594	939	4694
Avocet	d	191	d	d	5419	235	884	100	1366	6829

* = Flashlight Failed
d = No Data

Table 5: Years of burns at Fish Springs NWR.

Year	Units
1989	Shoveler
1990	Ibis, Pintail, Harrison
1991	Egret
1992	None
1993	Avocet (dry for 2 years)
1994	Ibis, Curlew
1995	Shoveler, Pintail
1996	None
1997	Harrison

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