Reproductive Success of Individual Razorback Suckers in Impounded Backwaters: A Progress Report

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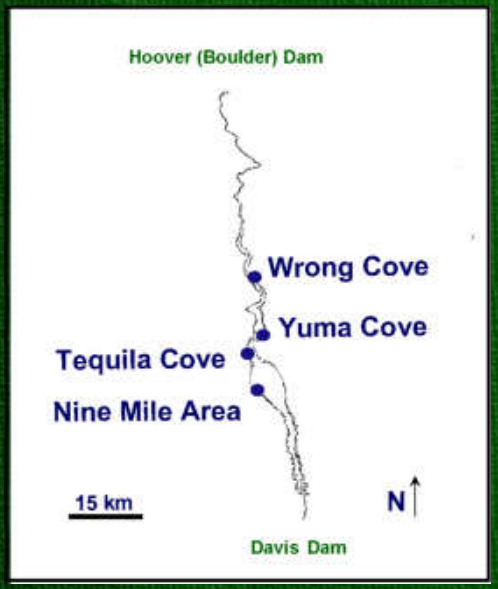
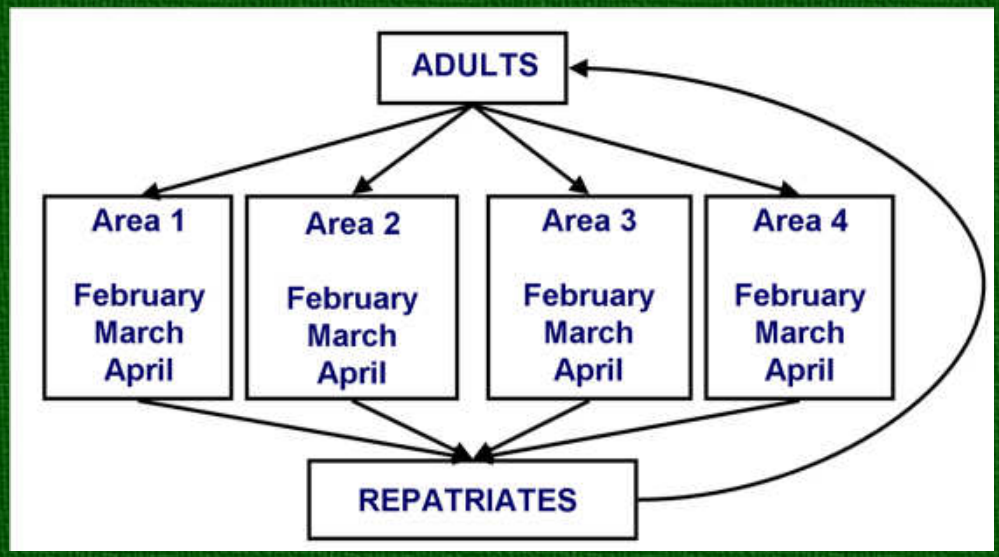
Razorback sucker (*Xyrauchen texanus*)

- Grows up to 1 meter long and 5kg
- Live 40+ years
- Iteroparous
- Highly fecund
  - ca. 200,000 eggs/large adult female

Lake Mohave Conservation management plan

- Initiated in mid-1990's
- Capture naturally produced larvae
  - Sample across regions throughout the spawning season to represent genetic diversity in the lake





Conservation management plan

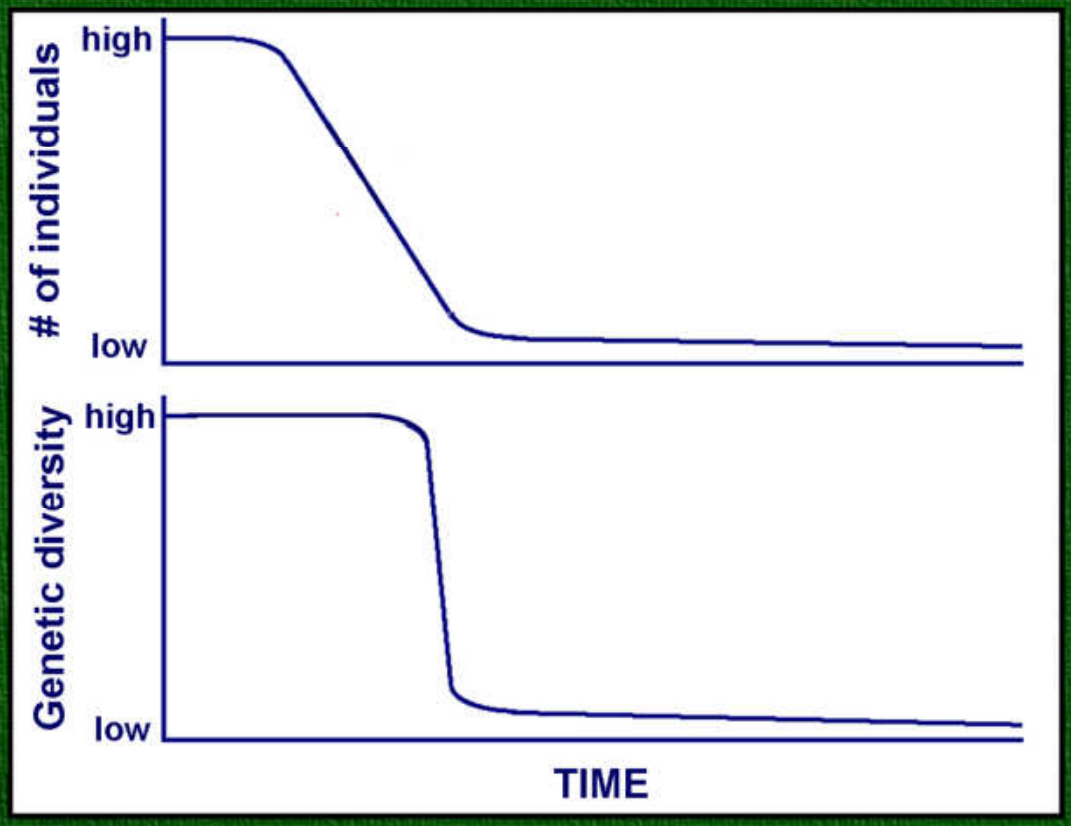
- **Reared in captivity**
  - **Hatcheries**
  - **Backwaters**

Lake Mohave Conservation management plan

- Release into the wild
  - PIT tag
- Monitoring
  - Native Fishes Work Group
  - Genetics

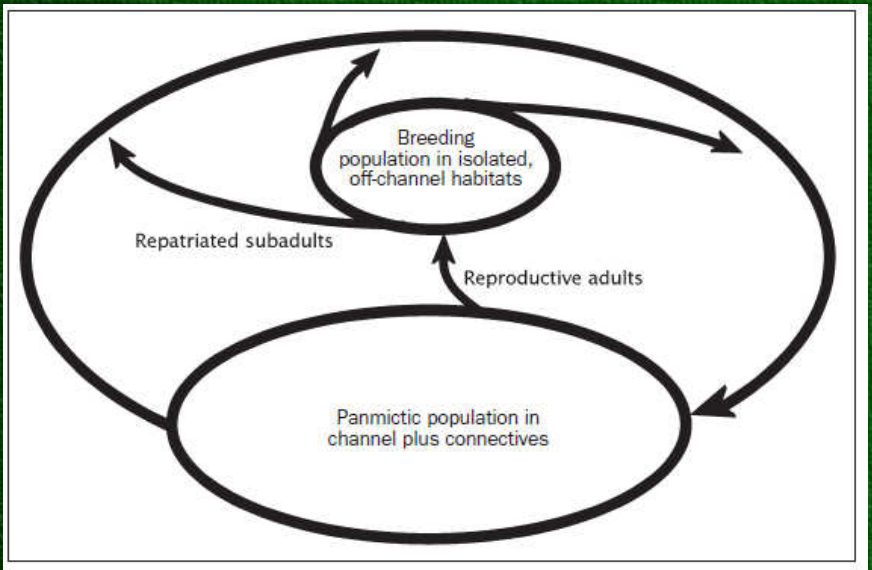
Impact on genetic diversity

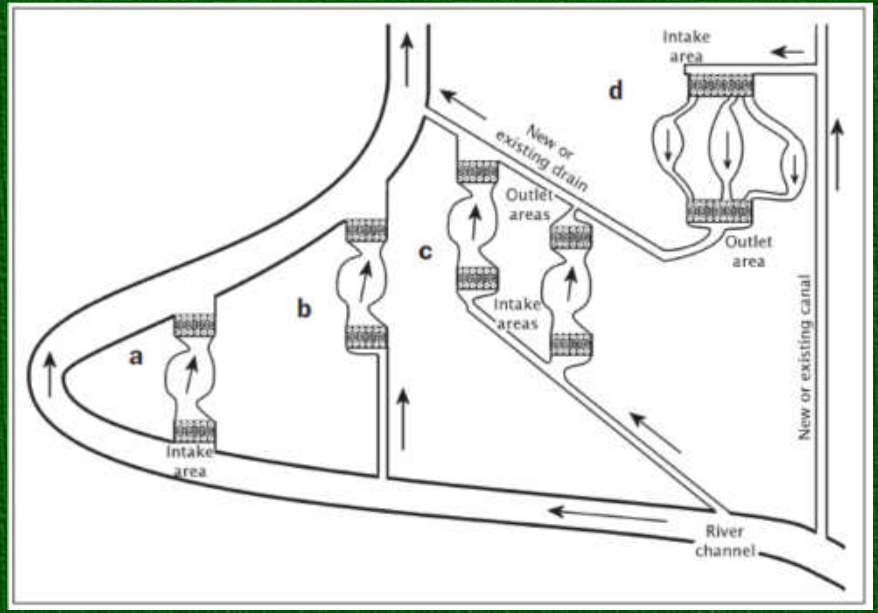
- Genetic diversity decreases with population size
  - Can have negative effects on health of population (e.g., inbreeding depression)



How do we preserve the population using backwaters?

- Develop isolated off-channel habitats
- Refuges for reproduction
- Interchange individuals with main river





Objective

To obtain information about reproductive success of individual razorback suckers kept in backwaters

- How many adults contribute?
- What is the proportion of offspring from individual contributions?
- Is there variation between backwaters?
- How many should we use in each pond?
- How often do we exchange them?

Methods

Stock adult razorback suckers in impoundments prior to spawning season.

- Equal sex ratios
- Fin clips

Gathered larvae throughout the spawning season, and juveniles during fall.

Genotype adults and offspring using microsatellites

- 14 Loci

Assign parentage using computer software MYKISS

Dandy Backwater

2010 – 99 ♀,101 ♂

2011 – 100 ♀, 100 ♂

2012 – 100 ♀, 100 ♂

2013 – 100 ♀, 100 ♂

2014 – 100 ♀, 100 ♂

Dandy Backwater

2010

- **207 Larvae; 36 ♀ 31 ♂; (40% Unique)**
- **40 juveniles; 17 ♀ 15 ♂; (55% Unique)**

2011

- **No Offspring**

2012

- **4 juveniles; 4 ♀ 4 ♂; (100% Unique)**

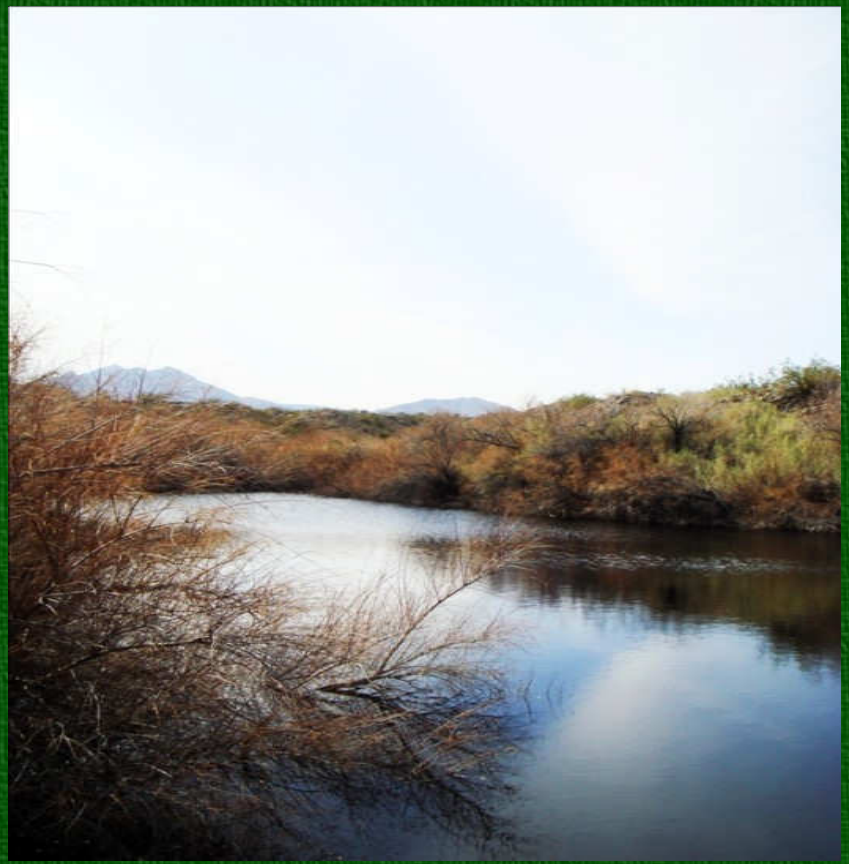
Dandy Backwater

2013

- **65 Larvae (25 ♀, 34 ♂); (81% Unique)**
- **40 juveniles (17 ♀, 15 ♂); (79% Unique)**

2014

- **No Offspring**



Arizona Juvenile Backwater

2010 – 129 ♀, 71 ♂

2011 – 100 ♀, 100 ♂

2012 – 100 ♀, 100 ♂

2013 – 102 ♀, 98 ♂

2014 – 100 ♀, 100 ♂

Arizona Juvenile Backwater

2010: 210 Larvae; 66 ♀ 39 ♂; (75% Unique)

2011: 305 Larvae; 68 ♀ 69 ♂; (79% Unique)

201 Juveniles; 43 ♀ 52 ♂; (71% Unique)

Arizona Juvenile Backwater

2012: 116 Larvae; 25 ♀, 35 ♂ (63% Unique)

246 Juveniles; 33 ♀, 39 ♂ (44% Unique)

- One Female produced 104 of 246

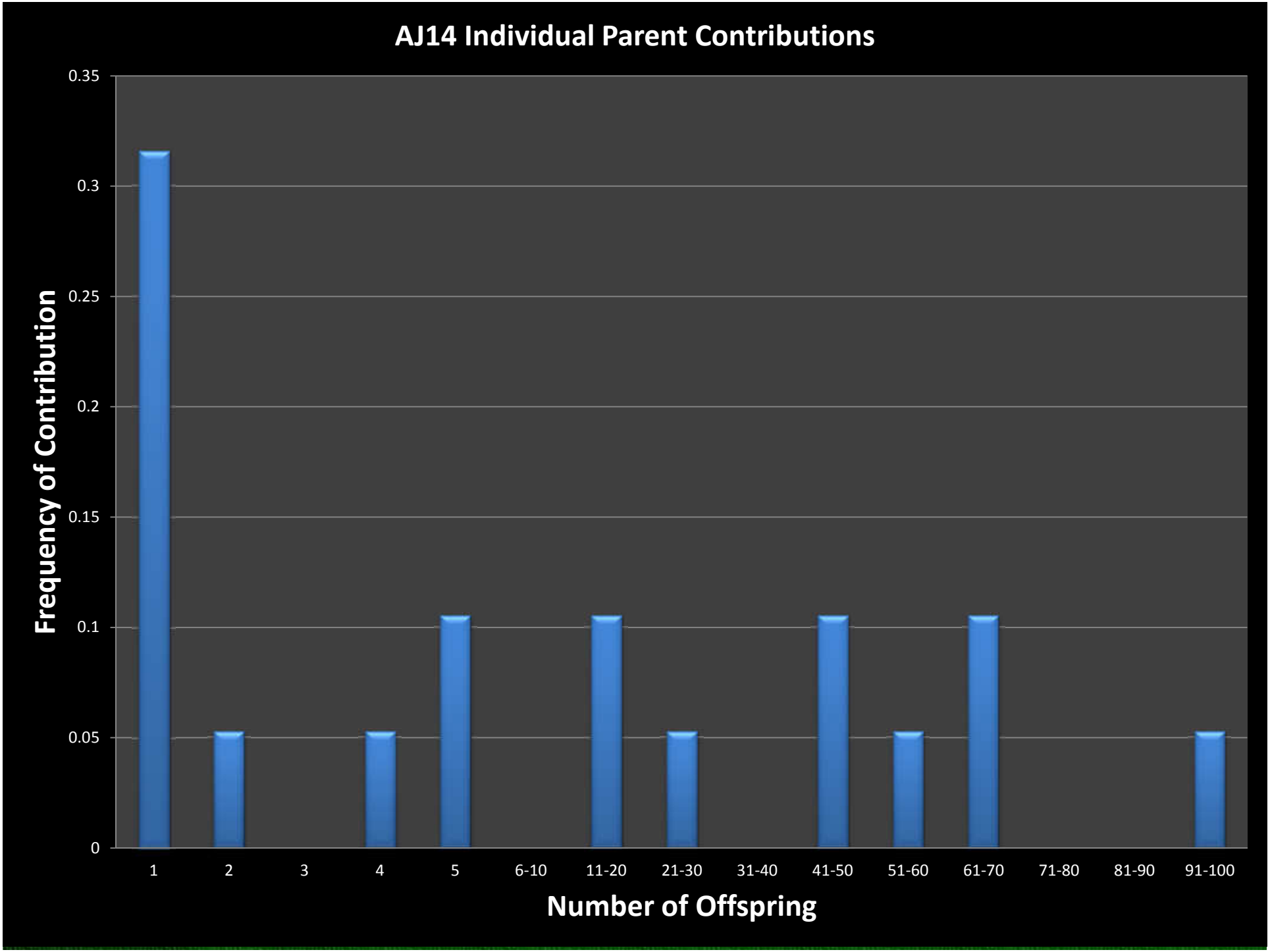
2013: 241 Larvae; 19 ♀, 46 ♂ (41% Unique)

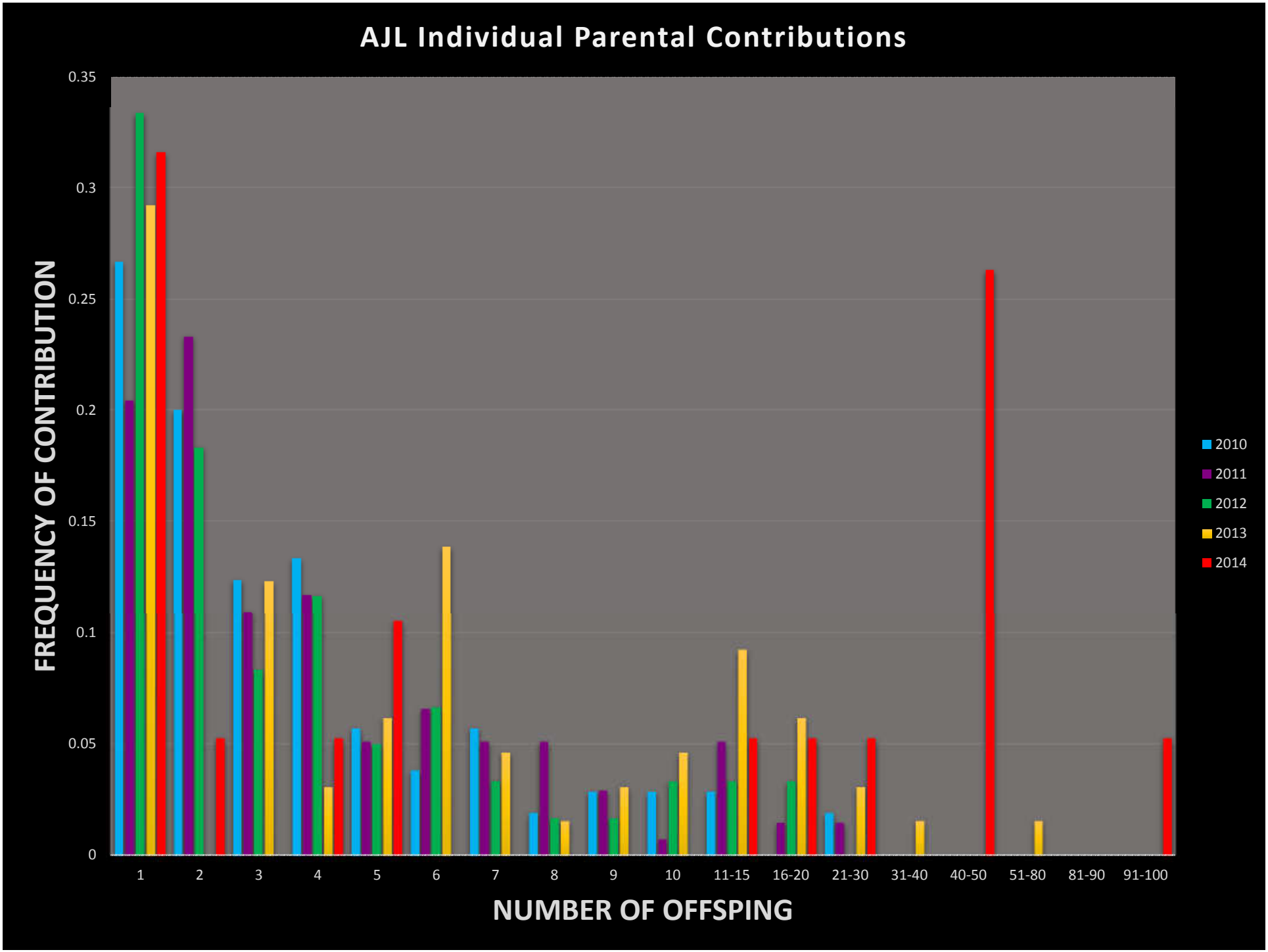
44 Juveniles; 33 ♀, 39 ♂ (79% Unique)

Arizona Juvenile Backwater

2014: 215 larvae collected

- **(6 collections)**
- **12 ♀ and 7 ♂ contributed (10% of adults)**
- **13% from unique female-male pairings (1 female produced 97 of 215)**


AJ14 Individual Parent Contributions
Frequency of Contribution
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1
2
3
4
5
6-10
11-20
21-30
31-40
41-50
51-60
61-70
71-80
81-90
91-100
Number of Offspring


AJL Individual Parental Contributions
FREQUENCY OF CONTRIBUTION
0.35
0.3
0.25
0.2
0.15
0.1
0.05
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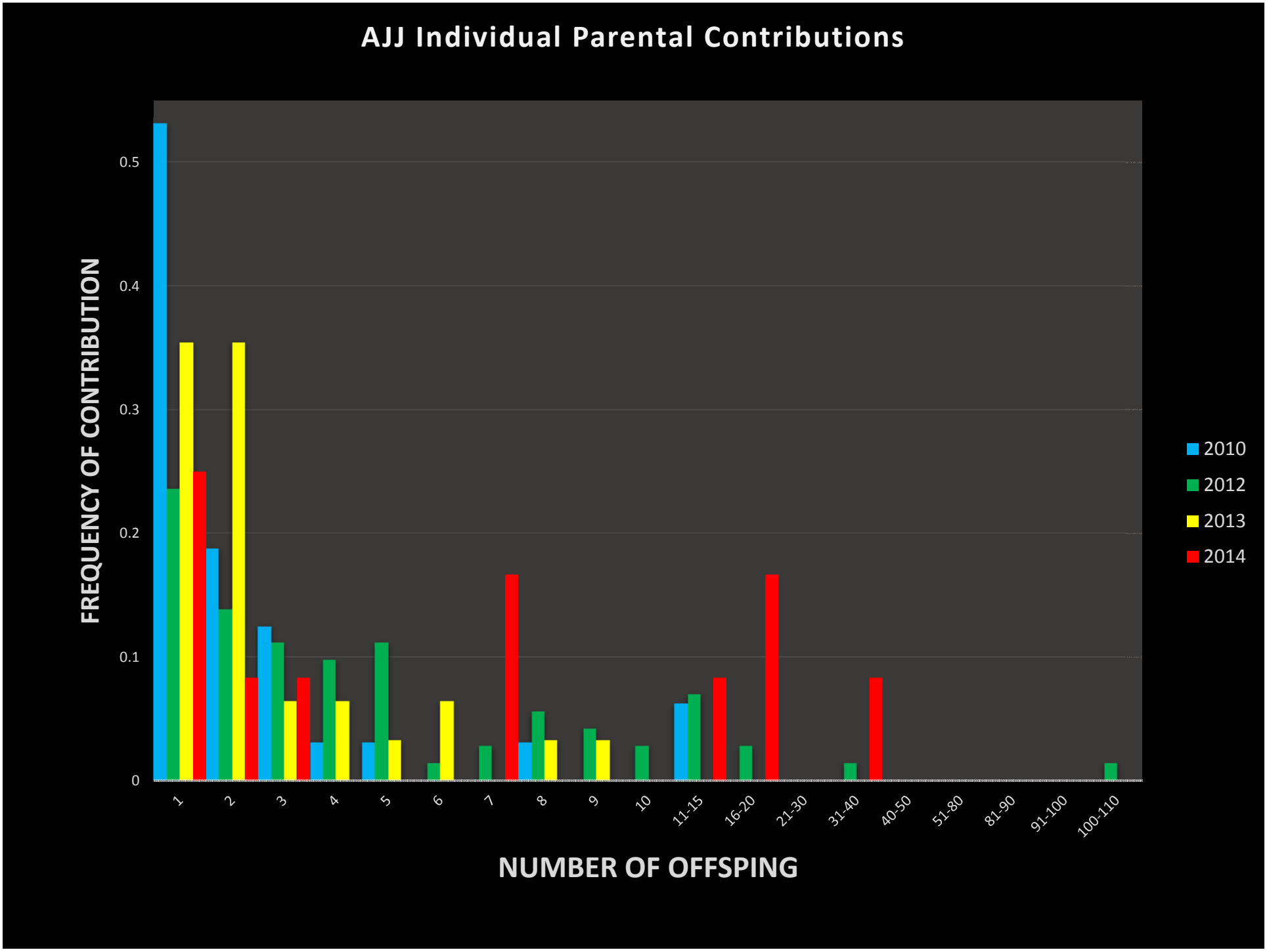
1
2
3
4
5
6
7
8
9
10
11-15
16-20
21-30
31-40
40-50
51-80
81-90
91-100
NUMBER OF OFFSPING
2010
2011
2012
2013
2014

Arizona Juvenile Backwater

2014: 59 juveniles collected

- **6 ♀ and 6 ♂ contributed (6% of adults)**
- **22% of the juveniles were from unique female-male pairings (1 female produced 36 of 59)**


AJJ Individual Parental Contributions
FREQUENCY OF CONTRIBUTION
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0.4
0.3
0.2
0.1
0
1
2
3
4
5
6
7
8
9
10
11-15
16-20
21-30
31-40
40-50
51-80
81-90
91-100
100-110
NUMBER OF OFFSPING
2010
2012
2013
2014

Yuma Backwater

2013

- **100 ♀,100 ♂**

2014

- **50 ♀,50 ♂**

Yuma Backwater

2013

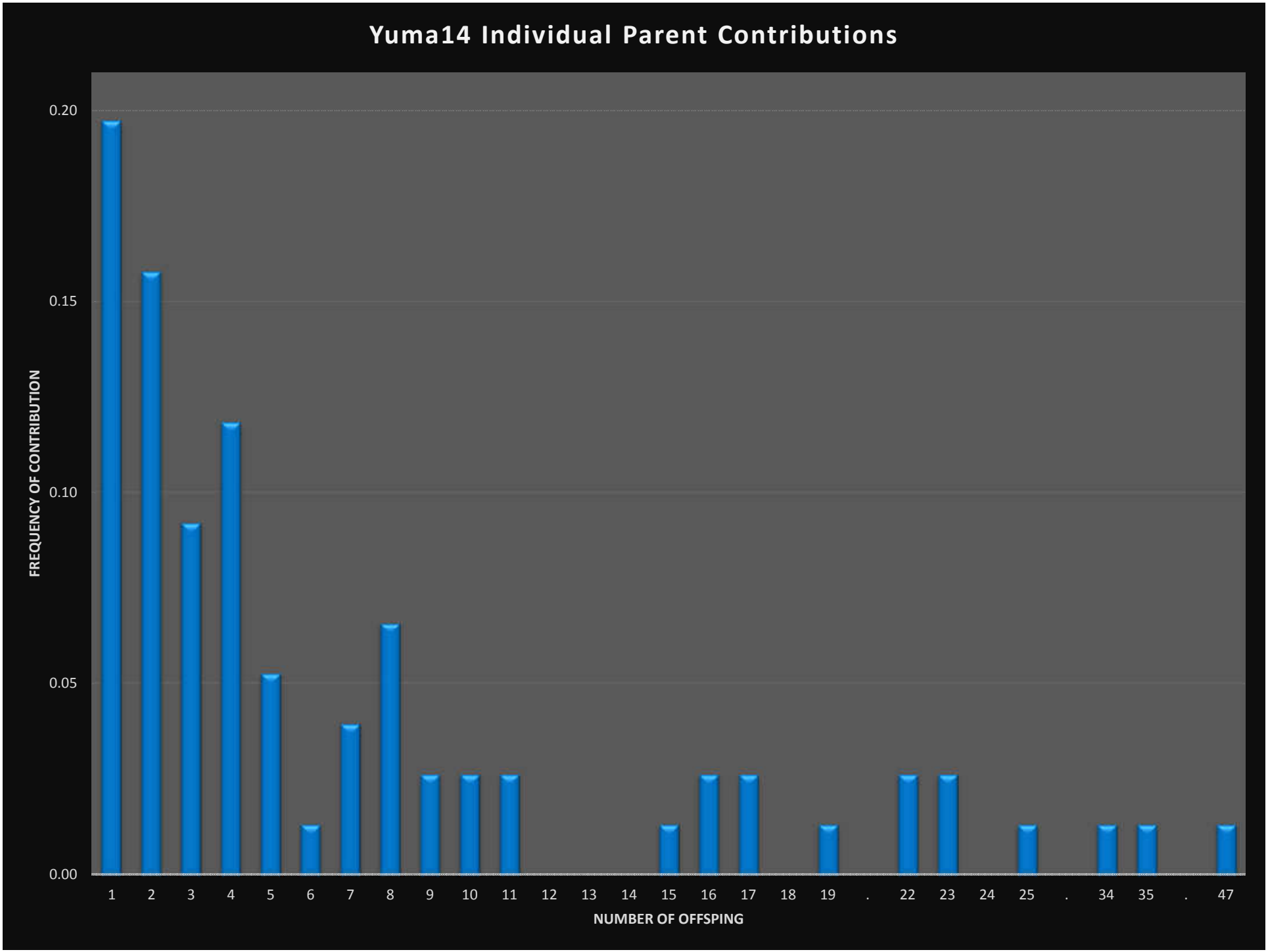
- **180 Larvae; 49 ♀, 50 ♂ (73% Unique)**
- **124 Juveniles; 14 ♀, 29 ♂ (35% Unique)**

One Female produced 73 of 124

Yuma Backwater

2014

- 287 larvae (3 collections)
- 56 ♀ and 20 ♂ contributed to larvae
  only 3 larvae had a parent from 2014 stocking
- 57% of the larvae from unique female-male pairings
- 1st time ever a male was the highest contributor


Yuma14 Individual Parent Contributions
FREQUENCY OF CONTRIBUTION
0.20
0.15
0.10
0.05
0.00
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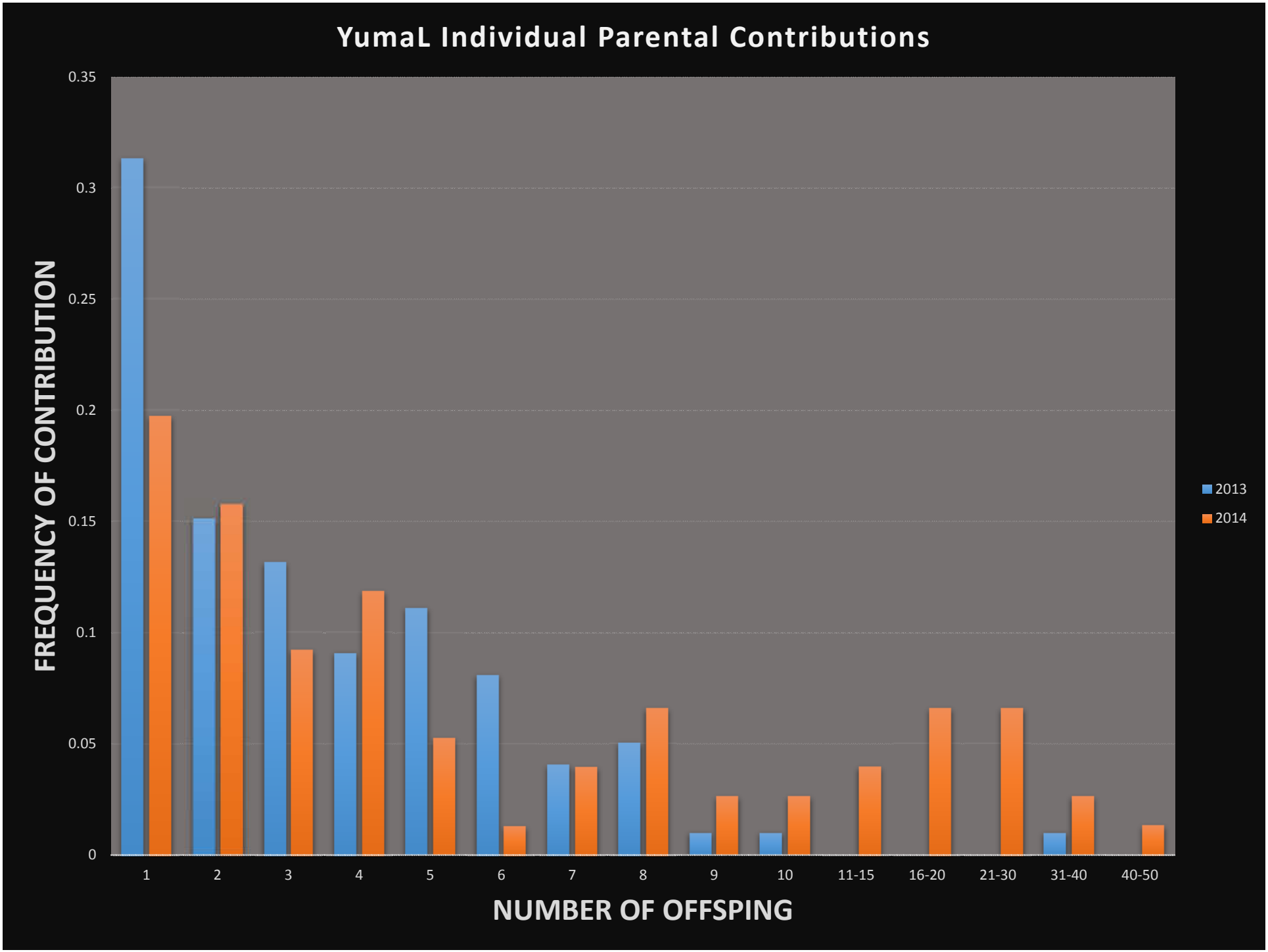
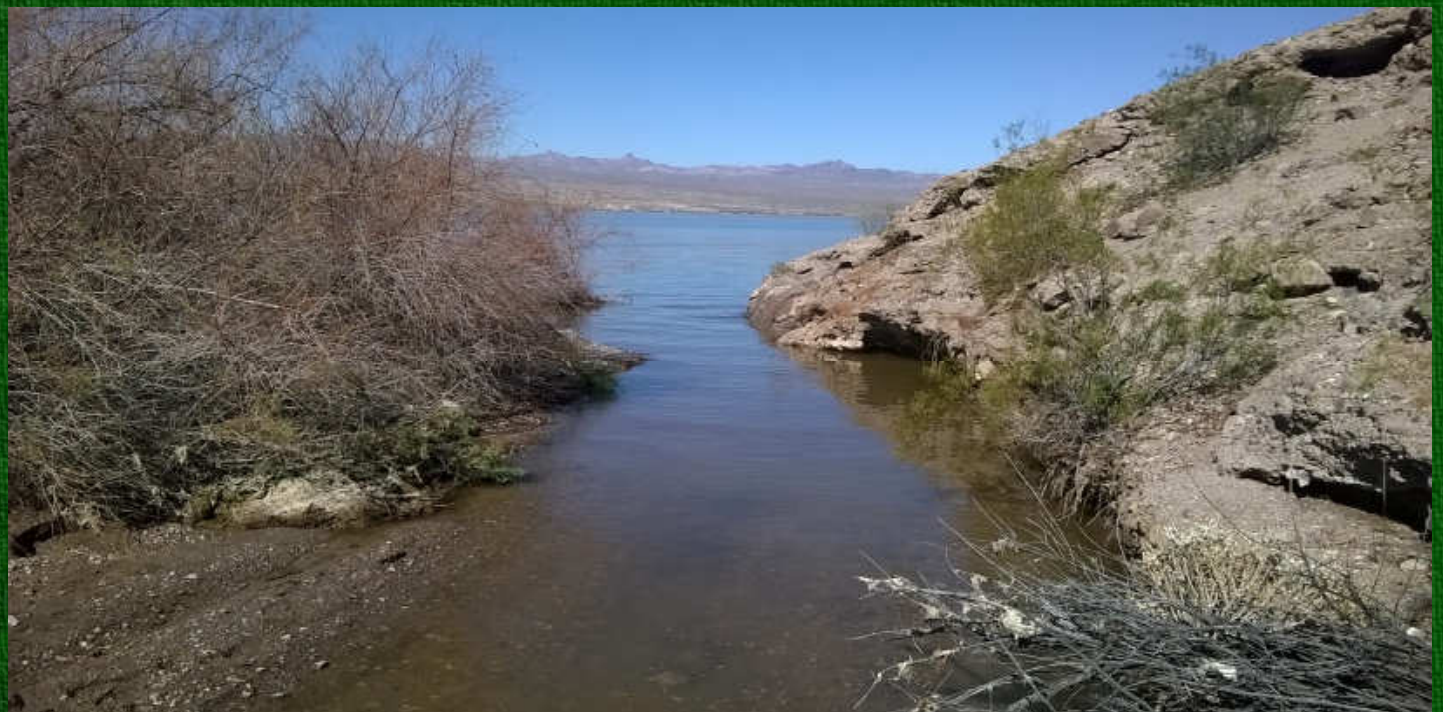
NUMBER OF OFFSPING


YumaL Individual Parental Contributions
FREQUENCY OF CONTRIBUTION
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1
2
3
4
5
6
7
8
9
10
11-15
16-20
21-30
31-40
40-50
NUMBER OF OFFSPING
2013
2014

Conclusions

AJ:

- Adult contributions in 2014 lower than past years
- AJ had reduced unique pairings
- Some individuals contributed many progeny



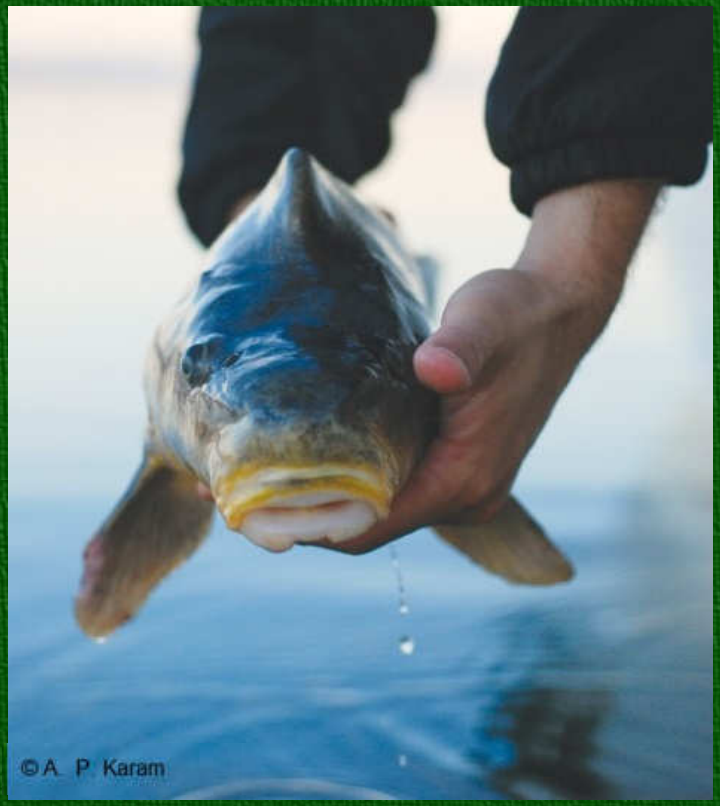
Conclusions

Yuma:

- Contributions skewed between sexes
- Two males from 2014 stocking contributed to 3 larvae
- The female with high contribution in 2013 had few larvae in 2014
- Highest contributor was male

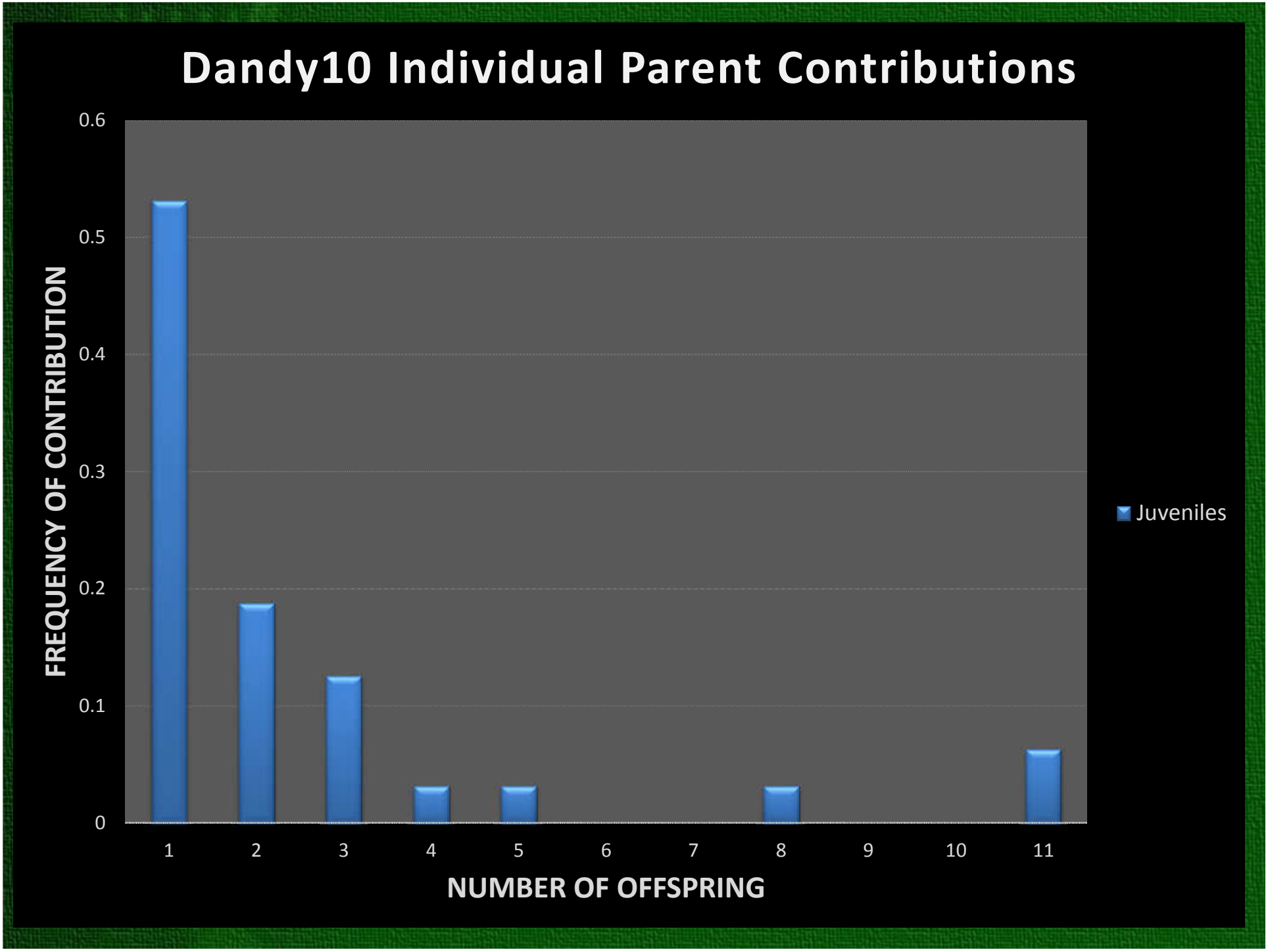
Future

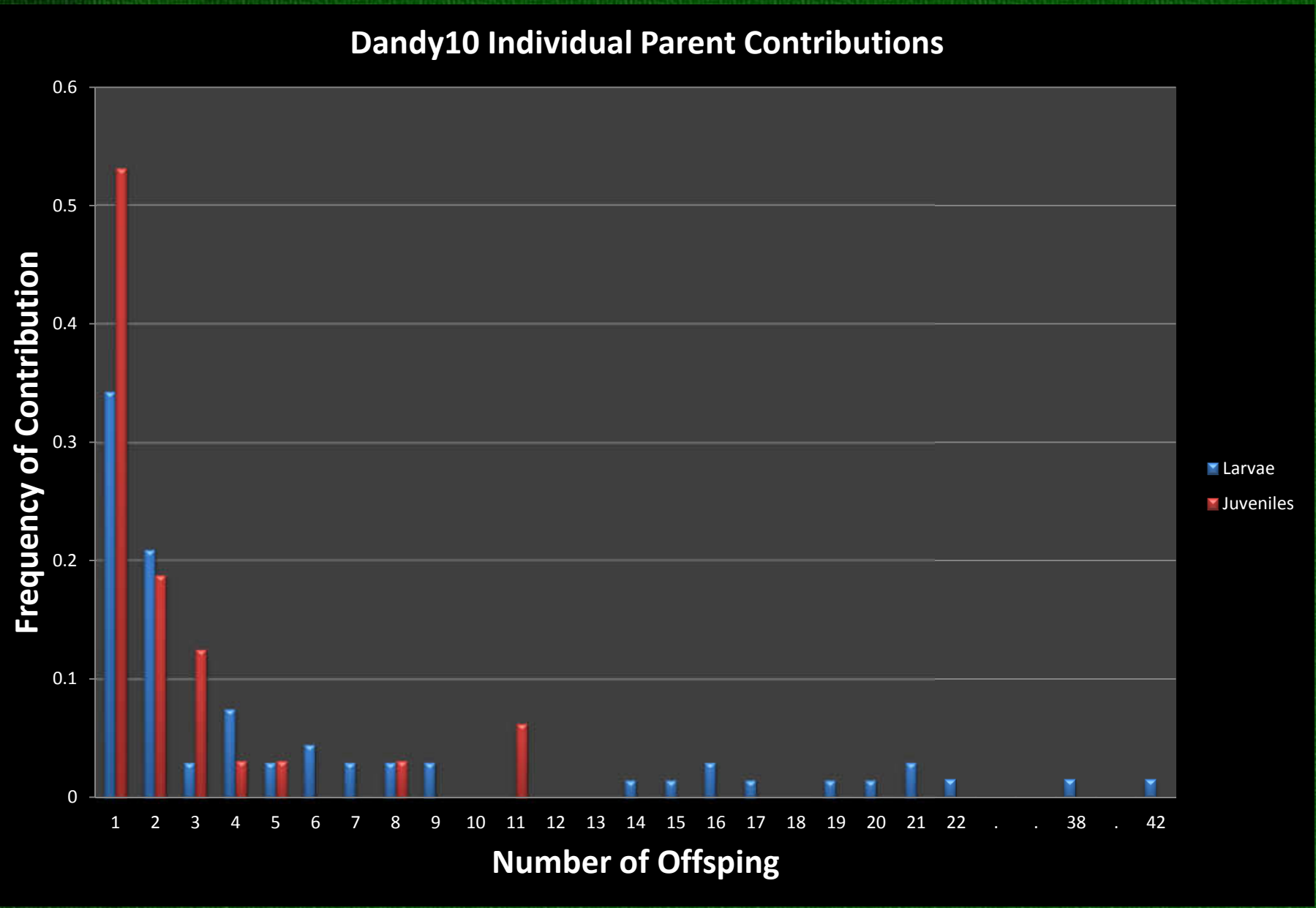
- Continue backwater experiments
- Try to understand differences among ponds
- Leave individuals in Yuma while supplementing

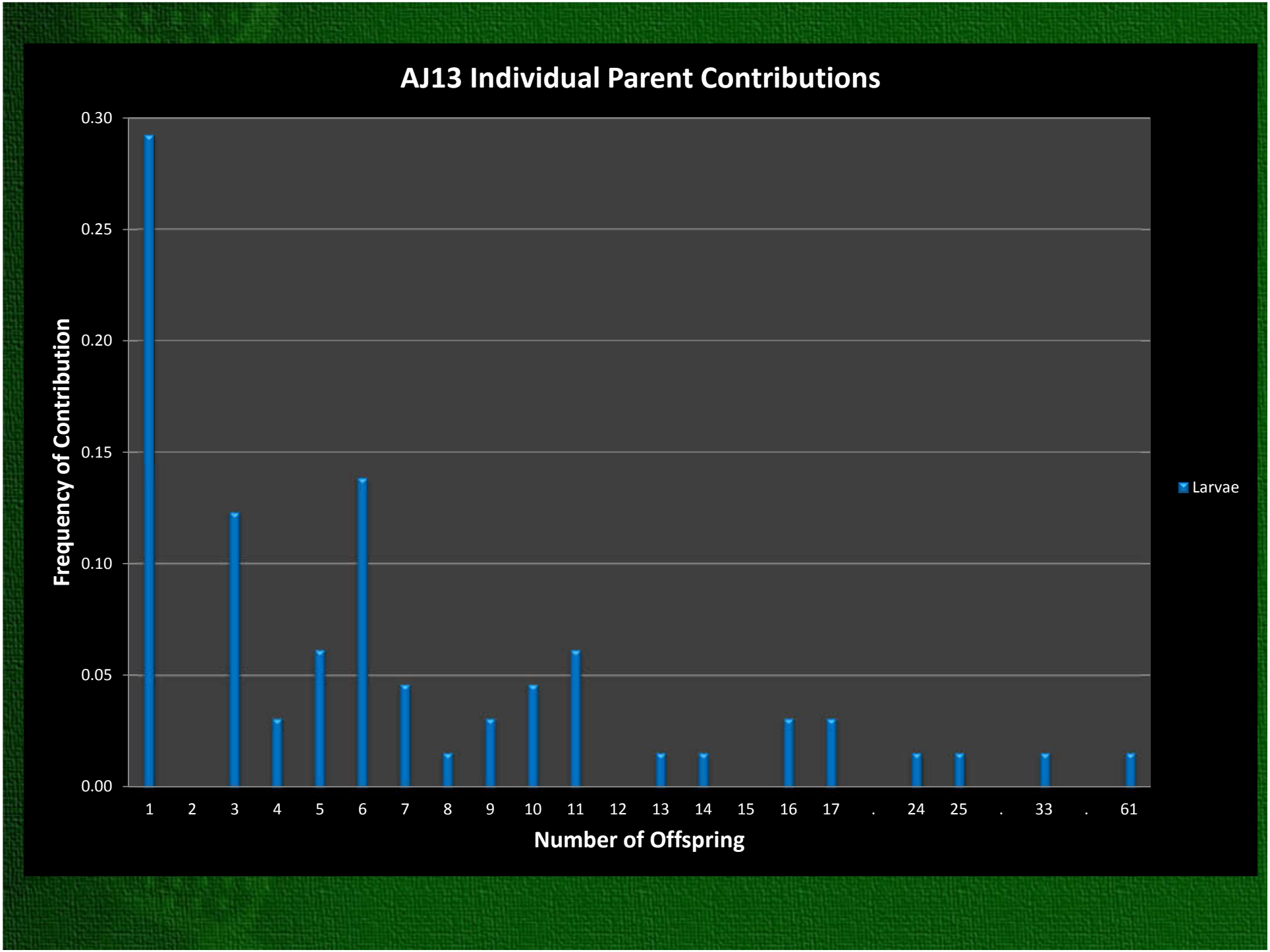


Acknowledgements

- MSCP
- Marsh & Associates
- Bureau of Reclamation


Dandy10 Individual Parent Contributions
FREQUENCY OF CONTRIBUTION
0.6
0.5
0.4
0.3
0.2
0.1
0
1
2
3
4
5
6
7
8
9
10
11
NUMBER OF OFFSPRING
Juveniles


Dandy10 Individual Parent Contributions
Frequency of Contribution
0.6
0.5
0.4
0.3
0.2
0.1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 . . 38 . 42
Number of Offsping
Larvae
Juveniles


AJ13 Individual Parent Contributions
Frequency of Contribution
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0.25
0.20
0.15
0.10
0.05
0.00
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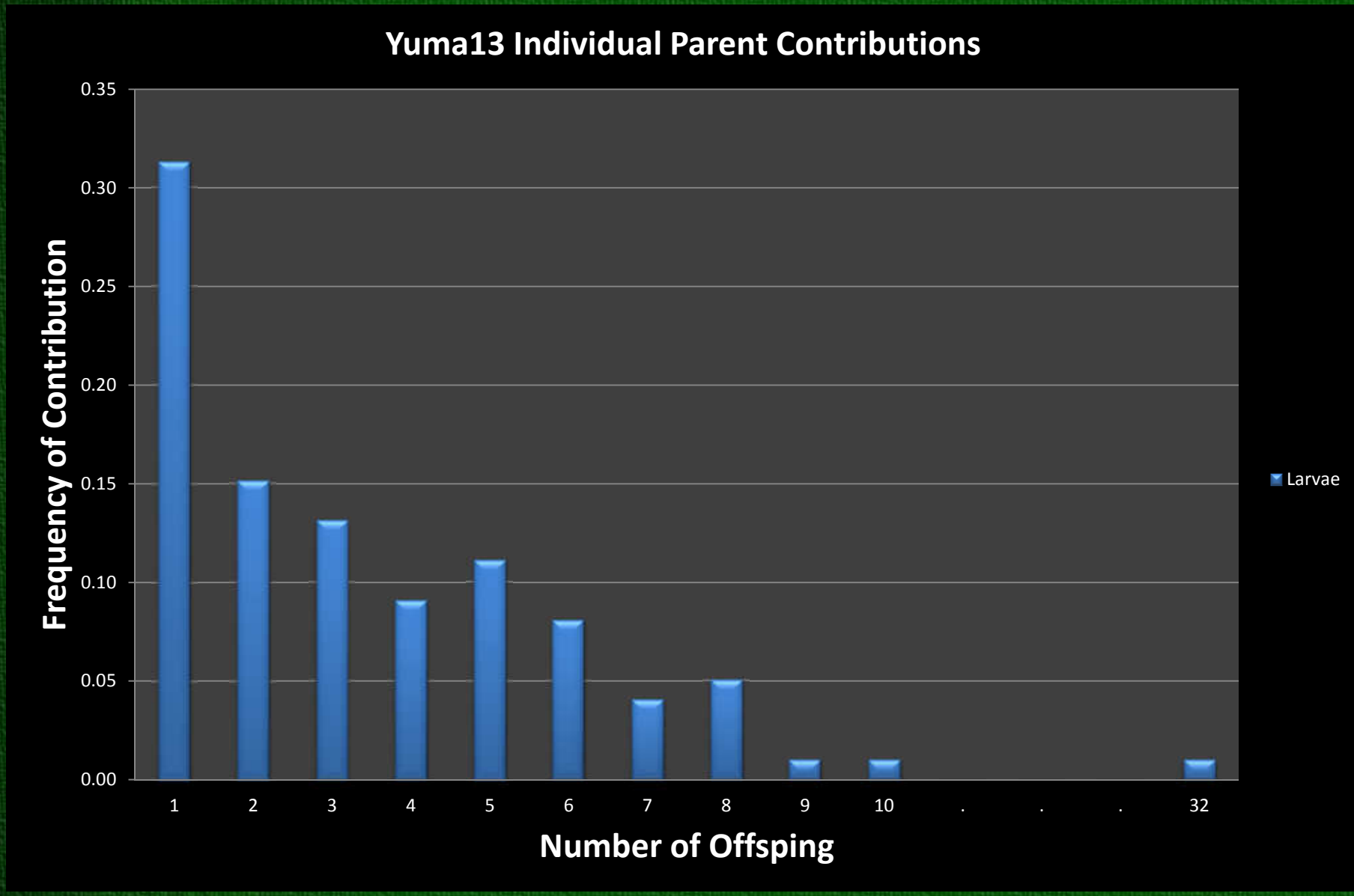
Number of Offspring
Larvae


Yuma13 Individual Parent Contributions
Frequency of Contribution
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1
2
3
4
5
6
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10
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32
Number of Offsping
Larvae

Dandy	# of Adults Stocked	# of Offspring	# of Parental Contributions	% of Unique Male Female Pairings
2010 spring	99 Females 101 Males	207 larvae	36 Female 31 males (33%)	40%
2010 fall	99 Females 101 Males	40 juveniles	17 Female 15 males (16%)	55%
2011 spring	100 Females 100 Males	0 larvae	0 Female 0 males (0%)	0%
2011 fall	100 Females 100 Males	0 juveniles	0 Female 0 males (0%)	0%
2012 spring	100 Females 100 Males	0 larvae	0 Female 0 males (0%)	0%
2012 fall	100 Females 100 Males	4 juveniles	4 Female 4 males (4%)	100%
2013	100 Females	65 larvae	25 Female	**81%**

	# of Adults Stocked	# of Offspring	# of Parental Contributions	% of Unique Male Female Pairings
2010 spring	129 Females 71 Males	210 larvae (4 collections)	66 Female 39 males (53%)	75%
2011 spring	100 Females 100 Males	305 larvae (6 collections)	68 Female 69 males (69%)	79%
2011 fall	100 Females 100 Males	201 juveniles	43 Female 52 males (48%)	71%
2012 Spring	100 Females 100 Males	116 larvae (3 collections)	25 Female 35 males (30%)	63%
2012 Fall	100 Females 100 Males	246 juveniles	33 Female 39 males (36%)	44% One Female produced 104 of 246
2013 Spring	102 Females 98 Males	241 larvae (6 collections)	19 Female 46 males (33%)	41%
2013 Fall	102 Females 98 Males	44 juveniles	11 Female 20 males (16%)	79%
2014	100 Females	215 larvae	13 Female	13% One Female

yuma	# of Adults Stocked	# of Offspring	# of Parental Contributions	% of Unique Male Female Pairings
2013 Spring	100 Females 100 Males	180 larvae (4 collections)	49 Female 50 males (50%)	73%
2013 Fall	100 Females 100 Males	124 juveniles	14 Female 29 males (22%)	35% One Female produced 73 of 124
2014 Spring	100 Females 100 Males	287 larvae (3 collections)	56 Female 20 males (10%)	57% All but 3 were spawn from 2013 stock, 1st time ever my highest contributor was male