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DEVELOPMENT OF CRITICAL LIFE STAGE ASSAYS:
TERATOGENIC EFFECTS OF SRS EFFLUENT COMPONENTS
ON FRESHWATER FISH, GAMBUSIA

FINAL REPORT

Dr. Malkait S. Guram
VOORHEES COLLEGE
DENMARK, SC 29042

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MASTER

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THE FINAL REPORT OF THE RESEARCH CARRIED OUT AT VOORHEES COLLEGE CONTAINS A COMPOSITE COMPILATION OF THE LAST TWO YEARS WORK.

THE DATA NOTE VARIATION IN THE NUMBER OF YOUNG FISH DELIVERED PER FEMALE VARY MARKEDLY BETWEEN SEVERAL PONDS ON THE SRS AND OFF SRS PONDS. THE REASONS FOR THIS ARE UNKNOWN AT PRESENT.

INITIAL RESEARCH WAS CARRIED OUT ON THE EFFECTS ON THE DEVELOPING FISH FETUS OF VARIOUS SUBSTANCES THAT MAY HAVE PRODUCED THESE VARIATIONS. FURTHER STUDY IS NECESSARY TO IDENTIFY THE FACTORS THAT PRODUCE THE OBSERVED ALTERATIONS.

Par Pond

June 11, 1990 Female number 2 delivered 5 fry.

June 26, 1990 First visit to Par Pond. Collection Day
approximate 35 females were collected. They
were left in water from their natural
habitat for twenty - hours. Four died in
that span of time.

June 27, 1990 All females collected were placed in
breeding tanks.

June 28, 1990 Females numbers 8, 10, 3, 4, 15, 19, died
and, females number 15 and 17 delivered fry.
15 delivered 3 fry
17 " 11 fry

June 29, 1990 Female number 2 died and was replaced.

July 2, 1990 Female # 8 delivered 25 fry
2 delivered 1 fry
Chemicals were added to the following tanks
2 1cc of Ln
3 1/2 cc of Ln
5 1/10 cc of Ln
11 1 cc of Co
12 1/2 cc of CO
13 1/10 cc of Co

July 3, 1990 Female number 3 (1 cc Ln) delivered 31 fry
Female number 4 delivered 8 fry

July 5, 1990 Female number 11 (1 cc Co) delivered 8 fry

Female number 19 delivered 7 fry

Female number 8 delivered 1 fry.

Collection Day, approximate 30 females were collected and left in their natural habitat for twenty-four hours. Temperature 84.7

degrees Fahrenheit (29.1 degrees Celsius)

The following chemicals were added to the tanks listed below.

7 1 cc of Va

8 1/2 cc of Va

9 1/10 cc of Va

1 1 cc of Hg

4 1/2 cc of Hg

6 1/10 cc of Hg

Female number 4 (1/2 cc Hg) delivered 2 fry.

July 9, 1990

Female number 4 died (1/2 cc Hg added 7/5/9)

" " 1 " (1 cc Hg added 7/5/90)

" " 9 "

" " 5 delivered 16 fry (1/10 cc

Ln added July 2, 1990.

Female # 12 delivered 15 fry (1/2 cc Co added July 2, 1990.

July 10, 1990

Female number 6 delivered 17 fry (1/10 cc Hg)

July 12, 1990

Female number 19 delivered 8 fry

July 16, 1990

Female number 20 delivered 10 fry

Female number 5 delivered 11 fry

Female number 15 delivered 15 fry

Female number 3 delivered 14 fry

(1/2 cc Ln)

Female number 1 delivered 10 fry

(1 cc Hg)

The following females had chemicals added,
died and was replaced. Female number

7 (1 cc Va)

2 (1 cc Ln)

18 (No chemicals)

Those tanks that contained chemicals with
females that died was washed and replaced
with another female.

July 17, 1990

Female number 1 delivered 1 fry

July 19, 1990

Collection Day, 15 females were collected
left in water from their natural habitat
for twenty -four hours. Used to replace
those females that died.

July 20, 1990

Female number 7 delivered 17 fry (1 cc Va)

July 23, 1990

Chemicals were added to the following tanks

20 (1 cc Tb)

19 (1/2 cc Tb)

18 (1/10 cc Tb)

Female number 10 died and was replaced.

July 25, 1990

Female number 20 delivered 7 fry (1 cc Tb)

July 30, 1990

Female number 20 delivered 1 fry (1 cc Tb)

Ash Basin

June 26, 1990 Collection Day, 15 females were collected.
Left in water from their natural habitat
for twenty - four two died in a 24 hour
period.

June 27, 1990 All females collected were transferred to
breeding tanks.

June 28, 1990 Females number 14, 4, 8, died no
replacement.

June 29, 1990 Females number 12, 4, 8, died no
replacement.

July 2, 1990 The following chemicals were added to the
tanks listed below.

 # 1 1 cc of St
 # 2 1/2 cc of St
 # 3 1/10 cc of St
 # 11 1cc of Na
 # 13 1/2 cc of Na
 # 14 1/10 cc of Na

Female number 14 delivered 14 fry.

July 3, 1990 Female # 12 (1 cc Na) delivered 4 fry
died after the delivery. Female number 9
delivered 17 fry.

July 5, 1990 The following chemicals were added to the
tanks listed below.

 # 10 1 cc of Hg
 # 9 1/2 cc of Hg

7 1/10 cc of Hg

6 1cc of Co

5 1/2 cc of Co

17 1/10 cc of Co

The eighteen females that were collected were left in water from their natural habitat for twenty-four hours .

Temperature of water at Ash Basin was 79.2 degrees Fahrenheit and 26.5 degrees Celsius, pH was 9.7.

July 6, 1990

All females were transferred to breeding tanks that were empty.

July 9, 1990

The following females died:

17 died 1/10 cc Co

10 died 1 cc Hg

9 died 1/2 cc Hg

7 died 1/10 cc Hg before death she delivered 12 fry.

Female number 18 delivered 12 fry

July 13, 1990

The following chemicals were added to the tanks listed below.

20 (1 cc of Hg)

19 (1/2 cc of Hg)

18 (1/10 cc of Hg)

July 16, 1990

Female number 3 delivered 14 fry (1/10 cc St)

Female number 2 delivered 6 fry (1/10 cc St

On 7/13/90 Hg was added to tanks numbers 18, 19, 20, they all died the tanks was washed and the females were replaced. Chemicals added to number 17 on 7/9/90 died on 7/16/90.

12 (1 cc Na) died

9 (1/2 cc Hg)

8 (1/10 cc Hg)

10 (1 cc Hg)

July 19, 1990 Collection Day, 21 females were collected, left in water from their natural habitat for twenty - four. They would be used to replace those females that died.

July 23, 1990 Females number 7, 8, 9, 10, and 18 died.
Female number 6 delivered 18 fry
Female number 1 delivered 6 fry (1 cc St)

18 (1/10 cc Tb)

19 (1/2 cc Tb)

20 (1 cc Tb)

1 delivered 10 fry (1 cc St)

July 25, 1990 Female number 1 delivered 10 fry (1 cc St

July 26, 1990 Female number 8 died and was replaced

July 27, 1990 Female number 17 delivered 6 fry
(1/10 cc Tb)

Female number ~~12~~ delivered 10 fry
1/2 cc Na

July 30, 1990 Female number 11 delivered 13 fry

Female number 16 delivered 7 fry

Female number 19 delivered 7 fry

(1/2 cc Tb). Females number 2, 16, died
and was replaced.

Lebby's

June 11, 1990 Female number 9 delivered 14 fry.
June 14, 1990 Female number 4 delivered 16 fry.
June 18, 1990 Chemicals were added to the following tanks.

1 1 cc Cd

2 1/2 cc Cd

3 1/10 cc Cd

Collection Day, weather hot and humid, very to collect females approximately 15 were collected.

June 19, 1990 All females with chemicals added survived.

June 20, 1990 Females number 3 and 4 died and was replaced. Cd solution increase to

2 cc in tank # 1

1 cc in tank # 2

1/2 cc in tank # 3

Chemicals were added to the following tanks

1 cc of Va to # 4

1/2 cc of Va to # 5

1/10 cc Va to # 6

June 21, 1990 Weather very hot and humid we were only able to collect 10 females. Females were left in water from their natural habitat for twenty - four hours.

June 22, 1990 Females placed in holding tank, started a second set of tens from Lebby. To this group Hg was added to the first three tanks

- # 1 1cc of Hg
- # 2 1/2 cc of Hg
- # 3 1/10 cc of Hg

June 25, 1990 Females in tanks number 11, 12, and 13, died after the chemicals Hg was added. The tanks were cleaned and restocked.

Female number 10 delivered 16 fry.

The chemical Hg was added to tanks number 11, 12, and 13.

June 27, 1990 After two days females 11, 12, 13, survived the amount of Va it was increased. Females died within a four hour. Female number 4, 5, and 6 died from their dosage of Va.

June 28, 1990 The amount of Va and Hg was increased in the respective tanks.

June 29, 1990 Female number 6 died from the solution of Va, # 3 died from the solution of Cd, # 1 died from the solution of Cd, # 12 died from the solution of As

July 2, 1990 Female number 10 delivered 8 fry.

July 3, 1990 Female # 9 died, Female # 1 with 1cc As died she delivered 1 fry. Collection Day

—

approximate 20 females were collected they were left in water from their natural

June 22, 1990 Females placed in holding tank, started a second set of tens from Lebby. To this group Hg was added to the first three tanks

- # 1 1cc of Hg
- # 2 1/2 cc of Hg
- # 3 1/10 cc of Hg

June 25, 1990 Females in tanks number 11, 12, and 13, died after the chemicals Hg was added. The tanks were cleaned and restocked.

Female number 10 delivered 16 fry.

The chemical Hg was added to tanks number 11, 12, and 13.

June 27, 1990 After two days females 11, 12, 13, survived the amount of Va it was increased. Females died with in a four hour. Female number 4, 5, and 6 died from their dosage of Va.

June 28, 1990 The amount of Va and Hg was increased in the respective tanks.

June 29, 1990 Female number 6 died from the solution of Va, # 3 died from the solution of Cd, # 1 died from the solution of Cd, # 12 died from the solution of As

July 2, 1990 Female number 10 delivered 8 fry.

July 3, 1990 Female # 9 died, Female # 1 with 1cc As died she delivered 1 fry. Collection Day

—

approximate 20 females were collected they were left in water from their natural

habitat for twenty - four hours.

July 4, 1990

All female were placed in breeding tanks.

July 5, 1990

The following females died number 10, 9,

6 1/2 cc of Va

5 1 cc of Va

4 2 cc of Va

3 1 cc of Cd

1 3 cc of Cd

20 delivered 10 fry

July 9, 1990

Collection Day approximately 15 female were collected. They were left in water from their natural habitat for twenty - four hours. The following females died 18, 3, and 1.

July 10, 1990

Nine females out of 15 collected died in within a twenty - four hours, others were placed in breeding tanks.

Female number 7 delivered 9 fry.

July 17, 1990

Collection Day, 15 females were collected left in water from natural habitat for twenty -four hour seven died within a that period, eight were placed in breeding tanks.

July 19, 1990

Collection Day, 12 females were collected left in water from the natural for twenty - four hour, used to replaced those females that died.

July 20, 1990 Female number 12 died 1/2 cc As
Female number 19 died

July 23, 1990 Female number 9 died
The chemical Tb was added to the following
tanks # 1 (1 cc Tb)
 # 2 (1/2 cc Tb)
 # 3 (1/ 10 cc Tb)

July 25, 1990 Females number 10, 19, 20 died and was
replaced.

July 26, 1990 Females number 9, 1, 5 18 died and was
replaced.

July 30, 1990 Female number 2 with 1/2 cc Tb died
Females number 11, 12, 13, died

July 31, 1990 Female number 1 delivered 6 fry (1 cc Tb)

Salkehatchie River

June 13, 1990 Female number 4 died

June 15, 1990 Females number 2 and 3 died

June 18, 1990 Females number 3 and 4 died

Chemicals were added to the following tanks

1 (1 cc Cd)

2 (1/2 cc Cd)

5 (1/10 cc Cd)

Collection Day, 10 females were collected and left in water from the natural habitat for twenty - hour, they were used to replaced those females that died.

June 19, 1990 Females in number 2 died, due to the small amount of Cd that was added another female was replaced in that tank.

June 20, 1990 Female number 4 delivered 26 fry.

Cd solution increased

1 (2 cc Cd)

2 (1 cc Cd)

3 (1/2 cc Cd)

June 21, 1990 Collection Day, only five females were collected left in water from their natural habitat for twenty - four hours .

June 22, 1990 All females that died were replaced.

June 25, 1990 Female number 9 delivered 12 fry.

June 28, 1990 Female number 10 died and was replaced.
 The chemicals were increased in tanks
 number 1, 2, 5,
 # 1 (3 cc Cd)
 # 2 (1 1/2 cc Cd)
 # 5 (1 cc Cd)

June 29, 1990 Female number 3 died
 Female number 1 died (3 cc Cd)

July 2, 1990 Females number 9, 8, 6, 4, died
 Female number 2 died (1/2 cc As)
 Female number 3 delivered 8 fry

July 3, 1990 Collection Day, only seven females were
 collected left in water from their natural
 habitat for twenty - four hours . Female
 number 7 died.

July 5, 1990 All females were placed in breeding tanks.
 Females number 5, 17 died and replaced.

July 9, 1990 Collection Day, only ten females were
 collected left in water from their natural
 habitat for twenty - four hours .

July 10, 1990 All females that we collected died.

July 16, 1990 Female number 2 died (1 1/2 cc Cd)

July 20, 1990 Female number 1 delivered 7 fry
 Female number 2 delivered 4 fry
 Female number 3 delivered 5 fry

~~July~~ 26, 1990 Female number 10 delivered 3 fry
 Female number 8 died and was replaced.

July 27, 1990 Females number 4 and 8 died.

Lake Edgar

June 15, 1990 Female number 8 died and replaced.

June 18, 1990 Female number 9 died and was replaced.

June 18, 1990 The chemical Cd was added to tank number five (1 cc Cd)

June 20, 1990 Female number 5 died.

June 21, 1990 Collection Day, all females that were collected was left in water from their natural habitat for twenty - four hours. Seven females were collected, two died with-in a twenty - hour period.

June 22, 1990 Female number 9 died and was replaced.
Started a second group for Lake Edgar. To this group the first three tanks the chemical As was added.
11 (1 cc As)
12 (1/2 cc As)
13 (1/10 cc As)

June 25, 1990 Females in tanks number 14, 15, 19, 10, and 9 died.

June 28, 1990 Females in tanks number 1, 3, and 5 died.
Tank were washed and restocked. Tank number
1 (1 cc As)
2 (1/2 cc As)
3 (1/10 cc As)

June 29, 1990 All females from the the above females

died, tanks washed and replaced.

July 2, 1990

Female number 4 died.

July 3, 1990

Female number 3 (1/10 cc As) died.

Female number 5 delivered 12 fry.

Collection Day, 15 females were collected.

Left in water from natural habitat for

twenty - four. Females that died were

discarded, tanks were washed, water

and females were replaced.

July 4, 1990

All females that were left in habitat were

placed in breeding tank.

July 5, 1990

The following females died

1 (1 cc As)

2 (1/2 cc As)

3 (1/10 cc As) delivered 6

fry before death.

11 11 (1 cc As) died

Tanks washed and water replaced along with females.

July 9, 1990

Female number five died (1/2 cc Cd)

Collection Day, all females collected was

left in water for twenty - four hour.

July 10, 1990

All females that were collected died.

July 12, 1990

Female number 4 delivered 19 fry.

~~July~~ July 27, 1990

Females number 1 and 10 died.

TANK #	DATE COLLECTED	Par Pond		# FRY	FRY/ FEMALE
		DATE	DELIVERED		
1	7/5/90	7/16/90		10	
2	5/28/90	6/11/90		5	
3	6/26/90	7/3/90		31	
3	7/5/90	7/16/90		14	22.5
4	6/26/90	7/5/90		2	
4	6/26/90	7/3/90		8	5
4	6/26/90	7/2/90		25	11.7
5	7/5/90	7/16/90		11	
5	7/7/90	7/9/90		16	13.5
6	6/26/90	7/10/90		17	
7	7/12/90	7/23/90		17	
8	6/27/90	7/2/90		25	
8	6/26/90	7/5/90		1	13
9					
10					
11	6/26/90	7/5/90		8	
12	7/2/90	7/9/90		15	
13					
14					
15	7/5/90	7/16/90		15	
15	6/26/90	6/28/90		3	9
16					
17	6/26/90	6/28/90		11	

18

19	7/5/90	7/12/90	8	
19	7/12/90	7/17/90	1	
19	6/16/90	7/5/90	7	
19	6/26/90	7/5/90	7	5.8
20	7/19/90	7/25/90	7	
20	7/19/90	7/30/90	1	4

15 females produced 265 fry

Fry / females = 17.67 average fry for Par Pond

ASH BASIN

TANK #	DATE COLLECTED	DATE DELIVERED	# FRY	FRY/ FEMALE
1	7/19/90	7/25/90	10	
1	7/2/90	7/23/90	6	8
2	7/5/90	7/23/90	6	
3	7/5/90	7/16/90	14	
4				
5				
6	7/5/90	7/23/90	18	
7	6/26/90	7/9/90	12	
8				
9	6/26/90	7/2/90	17	
10				
11	7/19/90	7/30/90	13	
12	6/26/90	7/2/90	4	
13	7/19/90	7/27/90	10	
14	6/27/90	7/2/90	14	
15				
16	7/19/90	7/30/90	7	
17	5/8/90	6/6/90	12	
17	7/19/90	7/27/90	6	10
18	7/5/90	7/9/90	12	
19	7/19/90	7/30/90	7	
20	7/5/90	7/16/90	10	

16 Females produced 178 fry

Fry / female = 11.13 average fry for Ash Basin

LEBBY'S POND

1	6/27/90	7/2/90	1	
1	6/24/90	7/31/90	6	3.5
4	6/8/90	6/14/90	16	
7	6/26/90	7/5/90	9	
9	6/8/90	6/11/90	14	
10	6/21/90	6/25/90	16	
10	6/18/90	7/2/90	8	
10	6/8/90	6/11/90	14	12.7
14	6/20/90	6/25/90	9	
14	6/8/90	6/14/90	26	17.5
20	6/26/90	7/5/90	10	

7 female produced 129 fry

Fry / female = 18.48 average fry for Lebby's Pond

LITTLE SALK

1	7/10/90	7/20/90	7	
2	7/10/90	7/23/90	4	
3	6/18/90	7/2/90	8	
3	7/10/90	7/23/90	5	13
4	6/18/90	6/20/90	26	
9	6/21/90	6/26/90	12	
10	7/10/90	7/23/90	3	

6 female produced 65 fry

Fry / female = 10.83 average fry for Little Salk

EDGAR

3	7/2/90	7/5/90	6
4	7/4/90	7/12/90	19
5	7/2/90	7/3/90	12

3 female produced 37 fry

Fry / female = 12.33 average fry for Lake Edgar

Summary and Progress Report

During the time that the project has been at Voorhees College, we the members of the Voorhees College family learned a lot from the life cycle of Gambusia. The project has enlighten us as how the fish species reproduces.

It has been demonstrated that Gambusia fish can be obtained from each of the test pond, and returned to Voorhees College laboratories in good physiological conditions. This was shown by very minimal loss of fish during and following capture, transportation, and subsequent placement in individual tanks for rearing young when delivered during subsequent weeks.

The goal of this phase was to place chemicals in the breeding tanks too see how long the females would survive in added chemicals. The females from the local ponds survival rate in added chemicals was shorter than those from the pond from SRS. Those that survived the added chemicals did delivered a minimal number. During this phase we also kept a profile on the number of fry's that was delivered by each female from each pond. Local and SRS ponds were visited on a weekly bases. During our visit we found that due to high temperature and humidity we unable to collect that many females in comparison to last summer.

Excellent technical help has been obtained from Voorhees College senior biology major students. These students have help to maintain the health of the rearing tanks throughout the period, have collected the fry as they are born, and

analyzed data obtained in observation in observation on theses fry. They are able to recognize the mature females well enough to determine if they would delivery fry.

During the month of June and July we received very little rain and the temperature was very hot. On an average we averaged temperature over 100 degrees for the major part of the summer phase. Due to the high temperature the Gambusia spent most of the time that we were collected the females under the mud. Because of the high temperature we found it difficult to collect a number as compared to the last two summers. Below is a comparison of Gambusias collected in 1988, 1989, and 1990 according to Par Pond and Ash Basin.

ASH BASIN		PAR POND	
COLLECTION DATE	# FEMALES	COLLECTION DATE	# FEMALES
6/17/88	40	7/6/88	70
6/19/89	30	7/14/89	15
6/26/90	15	6/26/90	35
6/24/88	100	7/18/88	50
6/24/89	2	7/19/89	20
7/5/90	20	7/5/90	30
7/6/88	OVER 90	7/25/88	25
7/6/89	0	7/24/89	10
7/19/90	21	7/19/90	15
7/18/88	40	8/1/88	25
7/20/89	10	8/1/89	9
7/25/88	25		
7/24/89	16		

7/29/88

30

7/26/89

10

Again, during this phase we noted that the size of the females that we collected this year was smaller than the one we collected in the past. The one from Ash was smaller and delivered fewer fry than those from last year. In 1988 Ash Basin delivered more fry than Par pond: in 1989 and 1990 Par Pond delivered more.

This is the last phase of the project, if delivered had not occurred within a two week period the female would be discarded from the holding tank as well as the breeding tanks. A special note will be made on the females as to the date of collection as well as the date that they delivered. Phase V of the Department of the Energy Biological Research began on June 5, 1990. Gambusias were collected on the following dates from Ash Basin and Par Pond

June 26, 1990

July 19, 1990

July 5, 1990

Local ponds collection were done on the following dates

June 6, 1990

July 9, 1990

June 18, 1990

July 19, 1990

June 21, 1990

July 3, 1990

ALL LOCAL POND COLLECTION WAS DISCONTINUED AFTER JULY 19, 1990.

During phase V of the program a total number of Gambusias collected from ponds On SRS are as following

ASH BASIN----- 46

PAR POND----- 80

On an average Par Pond had more fry per individual tank than any of the others.

Par Pond averaged 17.67 fry / tank

Ash Basin averaged 11.13 fry / tank

From the local ponds the following number of Gambusias were collected

Lebby's Pond----- 92

Lake Edgar----- 60

Little Salk----- 45

The average for each pond is listed below:

Lebby's Pond averaged 18.48 fry

Lake Edgar average 12.33 fry

Little Salk average 10.83 fry

During the summer chemicals were added to the following tanks with fry delivered in those tanks.

PAR POND

TANK NUMBER	NUMBER OF FRY	CHEMICAL
1	1	1 cc As
3	31	1 cc Ln
6	17	1/10 cc Hg
11	8	1 cc Co
20	7	1 cc Tb

The following tanks had chemicals added, but no delivery.

TANK NUMBER	CHEMICAL
2	1 cc Ln
3	1/2 cc Ln
5	1/10 cc Ln
12	1/2 cc Co
13	1/10 cc Co
7	1 cc Va
8	1/2 cc Va
9	1/10 cc Va
6	1/10 cc Hg
4	1/2 cc Hg
1	1 cc Hg
19	1/2 cc Tb
18	1/10 cc Tb

During the summer chemicals were added to the following tanks with fry delivered in those tanks.

TANK NUMBER	NUMBER OF FRY	CHEMICAL
1	10	1 cc St
1	6	1 cc St
2	6	1/2 cc St
3	14	1/10 cc St
6	18	1 cc Hg
13	10	1 cc Na
12	4	1 cc Na
17	6	1/10 cc Tb
18	12	1/10 cc Hg

The following tanks had chemicals added, but no delivery.

TANK NUMBER	CHEMICAL
11	1 cc Na
13	1/2 cc Na
14	1/10 cc Na
10	1 cc Hg
9	1/2 cc Hg
7	1/10 cc Hg
5	1/10 cc Co
20	1 cc Hg
19	1/2 cc Hg
20	1 cc Tb
19	1/2 cc Tb
18	1/10 cc Tb

PAR POND (1-11)

OF FRY

25

14 8 16

1

10 5 31 2 11 17 17 25 8

1 2 3 4 5 6 7 8 11

P&R POND (12-20)

Graph A 15 15 11 8 7
 Graph B 3 1 1
 Graph C 7
 Graph D 7

12
15
17
19
20

ASH BASIN (1-11)

Graph A

Graph B

OF FRY

10
9
8
7
6
5
4
3
2
1

11
10
9
8
7
6
5
4
3
2
1

ASH BASIN (12 - 20)

OF FRY

Graph A

Graph B

4 10 14 17 18 19 20

12 13 14 16 17 18 19 20

LEBBY'S POND

Graph A
Graph B
Graph C

Graph B

Graph C

Graph B

Graph A

14

8

26

10

9

16

14

9

16

1

6

1

4

7

9

10

14

14

20

LITTLE SALK

Graph A

Graph B

7
4
8
26
12
3

5

OF FRY

LAKE EDGAR

Graph A

OF FRY

6
19
12

Graph A

3
4
5

DOE/SR/10690-1

DEVELOPMENT OF CRITICAL LIFE STAGE ASSAYS:
TERATOGENIC EFFECTS OF SRS EFFLUENT COMPONENTS
ON FRESHWATER FISH, GAMBUSIA

PROGRESS REPORT

JUNE 1, 1989 - AUGUST 1, 1989

DR. M. S. GURAM AND MS. LORETTA F. GOODMAN

Voorhees College
Denmark, S. C. 29042

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PREPARED FOR THE U.S. DEPARTMENT OF ENERGY

— UNDER CONTRACT NUMBER —

DOE/SR/10690-1

PAR POND

- June 1, 1989 Females collected on June 1, 1989 were left in water from their natural habitat for twenty - four hours to be placed in breeding tanks on 6/2/89.
- June 5, 1989 Females in breeding tanks # 3, 4, 5, 6, 14, 16, 17, and 18 died all were replaced.
- June 6, 1989 Female # 5 died and was replaced.
- June 7, 1989 NO DATA CHANGE.
- June 8, 1989 NO DATA CHANGE.
- June 9, 1989 NO DATA CHANGE. Female # 17 died no replacement.
- June 12, 1989 Female # 14 delivered 13 fry collected on 6/1/89. Collection Day, we collected 38 large females they were left in their natural habitat for twenty - four hours.
- June 13, 1989 Females were removed from natural habitat and placed in breeding tanks, all females that were collected on 6/1/89 were discarded. Purpose of replacement: to place large females in breeding tanks in order to obtain a larger number of fry. Female number 14 delivered 85 fry (second female in this tank, collected on June 12, 1989. Her spot was still present therefore she was left in the breeding tank.
- June 14, 1989 Female # 18 and # 2 died replaced with another
- June 15, 1989 The following females delivered fry both were collected on 6/12/89.
10 delivered 21 fry
- June 16, 1989 The following females delivered fry
4 delivered 83 fry
14 " 3 " both were collected
on 6/12/89.
- June 18, 1989 The following females died and were replaced
13, 19, 9, and 1.

June 16, 1989 The following females delivered fry both were collected on 6/12/89.
4 delivered 83 fry
14 delivered 3 fry

June 18, 1989 The following females died and were replaced 13, 19, 9, and 1.

June 19, 1989 Collection Day, 30 large females were collected and left in their natural habitat for twenty - four hours. three died after this period.

June 20, 1989 The following females died and were replaced 12 and 16. The following female delivered fry
13 delivered 13 fry
12 " 6 fry
13 delivered 66 fry

June 21, 1989 The following females delivered fry # 18 was collected on 6/12/89 and # 17 was collected on 6/21/89
18 delivered 47 fry
17 " 38 "
18 " 24 fry (2nd group)

June 22, 1989 The following females delivered fry (same female as those on 6/21/89.
18 delivered 11 fry (3rd group)
17 " 5 " (2nd ")
18 was removed from breeding tank because of the disappearance of her dark spot.

June 23, 1989 Female inn breeding tank # 9 delivered 35 fry, collected on 6/20/89.

June 26, 1989 The following females died and was replaced. The following females delivered fry. All were collected on 6/20/89.
6 delivered 2 fry (still born)
9 " 66 fry
12 " 12 fry
15 " 26 fry
Collection Day, weather condition was hot and hazy , water level was high. Twenty females were collected they were left in water from their natural habitat for twenty - four hours. These were used to replace those that died earlier.

June 27, 1989 Sixteen large females were transferred to holding tank after a twenty - four hour period 4 females died. The following females delivered fry.
2 delivered 17 fry
12 " 13 "
16 died and was replaced by a female collected on 6/26/89.

June 28, 1989 All females that was in the holding tank died. They were collected on 6/26/89. The following females in breeding tanks died # 16, 12, 3, 5, and 9. Female # 11 delivered 36 fry.

June 29, 1989 Collection Day, water level was very high, But 22 females were collected . Once we returned to the college two fry were found in the containers they were labeled as " Transportation Fry".

June 30, 1989 Female # 13 delivered 48 fry collected on 6/29/89.

July 4, 1989 All females in the holding tank that was collected on 6/29/89 died. The following breeding tank females died # 1, 9, 10, 11, 12, 16, and 18.

July 5, 1989 The following females delivered fry # 8 was collected on 6/29/89 # 2 and 13 were collected on 6/29/89.
 # 8 delivered 50 fry
 # 13 delivered 18 fry
 # 2 delivered 15 fry

July 6, 1989 Collection Day, water level very high, current very swift but we were still able to collect 30 large females, they were used to replace those females that died earlier. Female # 2 delivered 23 fry.

July 7, 1989 The following females died and was replaced with another female, # 3 and 5. Female # 9 delivered 22 fry and # 13 delivered 67 fry.

July 8, 1989 Female # 20 delivered 33 fry 30 appeared to be still born. The following female died # 11, 18 and 3.

July 10, 1989 The following females delivered fry, they were collected on 7/6/89
 # 20 delivered 5 fry
 # 6 " 17 "
 Female # 7, 13 and 20 died.

July 11, 1989 Females # 11, 13, and 7 died and were replaced.

July 12, 1989 Female # 19 died and was replaced.

July 13, 1989 The following females delivered fry all were collected on 7/6/89.
 # 2 delivered 22 fry
 # 2 " 17 "
 Females # 8 and 6 died.

July 14, 1989 Collection Day,, we collected 15 females, they were used to replace those females that died earlier. Temperature and ph was taken in two different areas.

Temp.	Area 1	Area 2
F	84.0	84.0
C	28.9	28.8
ph	6.2	6.4

The current was very swift, water level very high it was very cloudy and the humidity was high.

- July 17, 1989 Females in breeding tanks 1, 5, 6, 7, 8, 11, 13, 16, 17, 18, and 19 died and were replaced. Female # 8 delivered 15 fry.
- July 18, 1989 The following females delivered fry
12 delivered 58 fry
17 " 15 " both were collected on 7/10/89. The following females in breeding tanks died 2, 4, 6, 9, 14, 18, 20 NO REPLACEMENT.
- July 19, 1989 Collection Day, we collected 20 females. They were used to replace all females that died earlier.
- July 21, 1989 Females number 2, 9, and 12 died. We collected enough females to replace those that died earlier
- July 22, 1989 All females that died were replace from the collection on 7/21/89.
- July 24, 1989 Collection Day, again all females that were collected were used to replaced those that died.
- July 26, 1989 Female # 19 delivered 13 fry, collected on 7/21/89.
- July 31, 1989 The following females delivered fry, they were collected on 7/24/89.
8 delivered 12 fry
14 " 12 fry
- August 1, 1989 Collection Day, water level very high, current very swift, hot and humid. Temperature and ph taken. Nine females were collected and left in water from their natural habitat for twenty- four hours.
Temp.

F	86.9	86.5
C	30.3	30.1
Ph	6.7	6.7
- August 2, 1989 After twenty - four hours those that were collected on 8/1/89 no females died. They were placed in holding tanks until after collection on this day. We were only able to collect one female, today again the water level was very high and the current was very strong. Females # 11, 12 and 13 died and all

August 4, 1989 Temperature and ph was collected on this no females.

Temp.

F 84.8 85.4

C 29.3 29.6

Ph 7.5 7.5

The following females delivered fry,

1 delivered 6 fry collected

7/24/89

6 delivered 9 fry (7/21/89)

7 " 5 fry (7/21/89)

August 7, 1989 The following females delivered fry and they were collected on 8/1/89

20 delivered 14 fry

19 " 19 "

6 " 9 "

The following females died with no replacement 6, 2, 17, 18, and 20.

ASH BASIN

- June 1, 1989 Females collected were left in their natural habitat for twenty - four hours and would be used to for the twenty breeding tanks on 6/2/89.
- June 5, 1989 Females collected on June 1, 1989 the following females died 4, 5, 8, 9, 10, 11, 15, 16, only # 4, 5, and 8 were replaced.
- June 6, 1989 Female # 2 delivered 4 fry collected on 6/1/89
- June 7, 1989 Female # 15 delivered 11 fry collected on 6/1/89.
- June 8, 1989 Female # 15 died (no replacement).
- June 9, 1989 NO CHANGE IN DATA. WEATHER CONDITION TO BAD TO COLLECT SPECIMENS.
- June 12, 1989 Collection Day, we collected 34 medium size females. Five died during transportation 29 were left in water from their natural habitat for twenty - four hours.
- June 13, 1989 All females that were collected on 6/1/89 were removed from breeding tanks and discarded and replaced with female that were collected on 6/12/89. Twenty females were replaced in breeding tanks and 7 placed in holding tanks. We collected a total of 34 females. Female # 20 delivered 20 fry collected on 6/12/89.
- June 14, 1989 Females # 1 died and was replaced.
- June 15, 1989 # 14 died and was replaced, breeding tank female # 20 delivered 2 fry.
- June 18, 1989 Females # 8 and 11 died and was replaced.
- June 19, 1989 Collection Day, 30 medium size females were collected they were left in water from their natural habitat for twenty - four hours. Female # 4 delivered 10 fry.
- June 20, 1989 All females collected were transferred to breeding or holding tanks 1 female died after a twenty - four hour period. Female # 13 died and was replaced with another female, she delivered 14 fry shortly after she was placed in the breeding tank.

June 21, 1989 Female # 13 delivered 16 fry collected on 6/19/89. (second group same female)

June 22, 1989 Female # 19 died and was replaced.

June 23, 1989 Female # 4 delivered 12 fry collected on 6/19/89.

June 24, 1989 Females # 5, 9, and 13 died and replaced with another female. Collection Day, moderate temperature slightly foggy, water level very high only two specimens were collected. Female # 1 delivered 8 fry all appeared to be stillborn, collected on 6/20/89.

June 27, 1989 All females that were collected on 6/24/89 were transferred to holding tank.

June 28, 1989 Females # 15 and 9 died and replaced.

June 29, 1989 Females # 8, 9, and 14 died and replaced, Female # 10 delivered 22 fry.

July 4, 1989 The following females die and were replaced, 8, 9, 10, 1, 16, 11, and 12.

July 5, 1989 Female # 18 delivered 5 fry collected on 6/19/89.

July 6, 1989 Collection Day, unable to collect any females. Female # 19 died no replacement. Water level at Ash Basin was extremely high.

July 7, 1989 Female # 18 died no replacement.

July 8, 1989 Females # 1 delivered 10 fry
 # 4 " 12 "
 # 15 " 7 "

all collected on 6/12/89. Female in breeding tank # 5 and 17 died.

July 9, 1989 The following females delivered fry all collected on June 12, 1989.
 # 14 delivered 9 fry
 # 12 " 7 "
 # 8 " 13 "

July 14, 1989 Collection Day usual areas visited but we were unable to collect any female, we found a stream a short distance from the Basin there we collected 10 female, two died during transportation. They were used to replaced females that died earlier. Temperature and ph

was taken from three areas and they are as follows:

Temp	AREA 1	AREA 2	AREA 3
F	87.8	88.3	83.0
C	30.6	30.1	28.3
ph	6.6	6.6	6.3

water level in our usual area for collection was very high. Weather condition cloudy and very humid.

- July 17, 1989 Female in breeding tank # 17 died and was replaced. Females in the following breeding tank delivered fry
- # 7 delivered 10 fry
17 " 10 "
- Several of the fry collected from this female appeared to have some form of mutation.
- July 19, 1989 Females # 15, 17, and 19 died and were replaced.
- July 20, 1989 Collection Day, we collected 10 females they were left in water from their natural habitat for twenty - four hours. Four died during transportation the other were used to replaced those females that died earlier.
- July 21, 1989 Females # 19 and 15 died and were replaced.
- July 22, 1989 Female # 1 delivered 2 fry collected on 7/21/89.
- July 24, 1989 The following female died and was replaced # 7, 16, and 17. The following females delivered fry.
- # 16 delivered 11 fry
20 " 5 "
- Collection Day, we collected 16 females five died during transportation the others were used to replaced those females that died earlier.
- July 25, 1989 Female # 5 delivered 15 fry. Female # 9 and 15 died and were replaced.
- July 26, 1989 Collection Day, we collected 10 females 6 died during transportation other used to replaced those females that died earlier.
- July 28, 1989 Female # 1 delivered 13 fry, collected 7/24/89.

July 31, 1989 The following females delivered fry, they were collected on 7/24/89

# 1	delivered	8 fry
# 8	"	19 "
# 11	"	4 "

August 1, 1989 Collection Day, water level high and temperature was high. We collected 6 females they were left in water from their natural habitat for twenty - four hours.

7 delivered 12 fry (7/26/88)
Temperature

F	87.0	83.2
C	30.5	28.3
Ph	7.2	7.3

August 2, 1989 Two females died after 24 hours. Collection Day, only 12 females were collected, water level was high, females were left in water from their natural habitat for twenty - four hours. The following females delivered fry they were collected on 7/26/89.

# 11	delivered	1 fry
# 20	"	2 "

August 4, 1989 Today only the temperature and ph was taken
Temperature

F	82.0	82.0
C	27.7	27.0
Ph	7.1	7.0

The following females delivered fry, they were collected on 8/1/89

# 3	delivered	14 fry
# 17	"	6 "

August 7, 1989 The following females delivered fry, they were collected on 8/1/89.

# 3	delivered	20 fry
# 14	"	3 "

The following died with no replacement
1, 7, 10, 12, 13, 15, and 20.

RISHER POND

- July 6, 1989 First visit to this pond since last summer. We collected only 6 medium size females. They were placed in breeding tanks on this date.
- July 7, 1989 Female number 6 delivered 22 fry, she was collected on 7/6/89.
- July 8, 1989 Females number 1, 6, 8, and 9 died with no replacement.
- July 11, 1989 Female number 11 died.
- July 12, 1989 Female number 5 delivered 18 fry.
- July 14, 1989 Collection Day, we collected 8 females, four died during transportation, the other four were placed in breeding tanks. Temperature and ph was taken on this date.
Temperature		
F	84.4	85.0
C	29.1	29.6
ph	6.6	6.3
- July 21, 1989 Collection Day, we collected 9 females, all were used to replaced those that died earlier
- July 24, 1989 Collection Day, we collected 8 females one was placed in breeding tank the other were placed in holding tank.
- July 31, 1989 Female number 1 delivered 14 fry, she was collected on 7/14/89. Females numbers 2, 3, 4, 5, 7, 8, and 10 died.
- August 1, 1989 Collection Day, water level and temperature was high. Female # 6 delivered 13 fry. temperature and ph was taken.
Temperature		
F	83.7	84.2
C	28.7	29.0
ph	6.6	6.9
- Seven large females were collected and left in water from their natural habitat for twenty -four hours.
- August 2, 1989 After twenty - four hours 4 out of the 7 died the others were placed in breeding tanks. Collection Day again this time we went to an area that was lower than our regular area and we collected 15 large females. Again they were left in water from their natural habitat for twenty - four hours. Female

number 9 delivered 31 fry, she was collected on 8/1/89. All female collected on this date was placed in breeding tanks.

August 4, 1989 Only temperature and ph was taken
Temperature

F	88.0	87.8
C	30.8	30.8
ph	7.1	6.9

August 7, 1989 Female # 10 delivered 13 fry.

Scar Face

June 1, 1989 Collection Day NO SPECIMENS

June 12, 1989 NO SPECIMENS

June 19, 1989 NO SPECIMENS

June 24, 1989 NO SPECIMENS

July 6, 1989 NO SPECIMENS, I've concluded that there are no specimens that we can use but we will keep trying.

July 14, 1989 On this trip we spotted some very small Gambusias, they were to far out and to small. Temperature and ph was taken.

Temperature

F	85.5
C	29.7
ph	5.7

August 1, 1989 Collection Day, water level and temperature high was high. Today we were able to collect 6 large females they were left in water from their natural for twenty - four hours.

August 2, 1989 After twenty - four hours 5 of the 6 females died. Packed in acetic acid for study, On this trip we were unable to collect any females.

August 4, 1989 Today we only collected temperature and ph
Temperature

F	80.1	90.5
C	32.1	32.5
ph	6.8	6.5

ALL SPECIMENS COLLECTED DIED.

LEBBY'S POND

- June 6, 1989 Collection Day, visited the pond only collected two females, pond conditions very poor. The two females that were collected were left in water from their natural habitat for twenty - hours.
- June 7, 1989 The two females that were collected was placed in breeding tanks.
- June 12, 1989 Female in breeding tank number 1 delivered 21 fry.
- June 13, 1989 Collection Day, we collected 21 large females, they were left in water from their natural habitat for twenty - four hours.
- June 14, 1989 All females that were collected was transferred to breeding tanks. One female died over the twenty -hour period. Six were placed in breeding tanks and 14 were placed in holding tanks. The following females delivered fry
# 3	delivered	15	fry
# 3	"	52	" (2nd group)
# 3	"	8	" (3rd ")
# 4	"	22	"
- June 15, 1989 Female # 4 delivered 49 fry (2nd group). Females in breeding tanks # 5, 6, 7, 8, and 9 died all were replaced with another female. Female # 3 was replaced with another female after having 75 fry within two days.
- June 18, 1989 Female # 5 died and was replaced.
- June 19, 1989 Female # 4 died and was replaced.
- June 20, 1989 Collection Day, we collected 15 large females. Water level was very high and it was very cloudy. They were left in water from their natural habitat for twenty - four hours.
- June 21, 1989 Female # 5 died and was replaced.
- June 22, 1989 Female # 5 died and was replaced with another female.
- June 24, 1989 Females # 2 and 3 died and was replaced with another female. The following female delivered fry.
# 10	delivered	29	fry
# 5	"	23	"
- Both were collected on June 20, 1989.

- June 29, 1989 Females number 7 and 1 died and were replaced. Female # 2 delivered 55 fry. Collection Day, we collected 23 large females some were used to replaced those that died earlier the others were placed in holding tank for later use.
- July 4, 1989 The following females died and replaced, 1, 2, 5, 6, 8, 9, and 10.
- July 5, 1989 Female number 7 delivered 45 fry.
- July 6, 1989 The following females died and were replaced 3, 5, 6, 7, 8, 9, and 10.
- July 7, 1989 The following females died and was replaced 5, 8, 9, and 10. Collection Day, we collected 15 large females they were left in water from their natural habitat for twenty - four hours. They were used to replaced those females that died earlier.
- July 8, 1989 Female number 5 delivered 16 fry, collected On July 7, 1989. Females # 6, 9, and 10 died.
- July 10, 1989 Female # 1 delivered 26 fry, collected on July 7, 1989.
- July 13, 1989 Female # 2 delivered 5 fry, collected on July 7, 1989. The following females died and was replaced, 8, 9, and 10.
- July 21, 1989 Female number 6 delivered 19 fry collected on July 12, 1989.

AT THIS POINT WE DISCONTINUED COLLECTING FROM
LEBBY'S POND.

LITTLE SALKEHATCHIE RIVER

- June 13, 1989 First visit to this pond, we collected fifteen large females they were left in water from their natural habitat for twenty - four hours.
- June 14, 1989 Nine out of the fifteen died, six were placed in breeding tanks.
- June 15, 1989 Females in the following tanks died, no replacements, 1, 2, 3, 5, 7, 8, and 9.
- June 20, 1989 Collection Day, we collected 10 females to replace those that died on 6/15/89.
- June 21, 1989 Female number 2 delivered 15 fry.
- June 23, 1989 Females number 10, 9, 6, and 2, died no replacements.
- June 24, 1989 All females that died were replaced with females that were collected on today. Ten were collected.
- June 29, 1989 Females number 3, 5, and 7 died.
- July 8, 1989 Female number 10 delivered 9 fry
" " 6 " 32 fry
" " 2, 3, 7, and 8 died.
- July 10, 1989 Female number 6 delivered 8 fry collected on 7/7/89.
- July 12, 1989 Female number 4 delivered 4 fry, collected on 7/7/89.

DISCONTINUED COLLECTING FROM THIS POND.

LAKE EDGAR BROWN

- June 13, 1989 First visit to this pond. We collected a total of 14 large females they were left in water from their natural habitat for twenty - four hours.
- June 14, 1989 Nine females were placed in breeding tanks, five of the 14 died. Females in breeding tank number 1, 3, and 7 died no replacement.
- June 19, 1989 Collection Day, Fifteen females were collected they were left in water from their natural habitat for twenty - four hours. Female in breeding tank # 10 died and was replaced.
- June 20, 1989 Females in tank # 1, 3, 7, and 10 die and was replaced with females collected on 6/19/89.
- June 21, 1989 Female # 8 delivered 43 fry collected on 6/19/889.
- June 22, 1989 Female # 2 died and was replaced.
- June 26, 1989 Female # 1 delivered 8 fry, collected on 6/19/89.
- June 30, 1989 Female # 1 delivered 13 fry, collected on 6/19/89.
- July 4, 1989 Female # 2 delivered 33 fry, collected on 6/19/89 and female # 10 died, no replacement.
- July 5, 1989 Female # 2 delivered 15 fry.
- July 6, 1989 The following females delivered fry
9 delivered 30 fry
6 " 32 "
2 " 3 " (still born)
- July 7, 1989 The following females delivered fry,
9 delivered 3 fry
7 " 4 "
4 " 56 "
All were collected on 6/29/89.
- July 13, 1989 Female # 5 died and replaced.
- July 18, 1989 Female # 3 delivered 21 fry.

DISCONTINUED COLLECTING FROM THIS POND.

PAR POND

TANK NUMBER	DATE COLLECTED	DATE DELIVERED	# FRY	FRY/ FEMALE
1	7/24/89	8/4/89	6	
2	6/20/89	6/27/89	17	
2	6/29/89	7/5/89	15	
2	7/ 6/89	7/6/89	23	
2	7/6/89	7/13/89	39	23.5
3				
4	6/12/89	6/16/89	83	
5				
6	6/20/89	6/26/89	2	
6	7/6/89	7/10/89	17	
6	8/1/89	8/4/89	9	
6	8/1/89	8/7/89	9	9.25
7	8/1/89	8/4/89	5	
8	6/19/89	6/29/89	50	
9	6/20/89	6/23/89	35	
9	6/20/89	6/26/89	66	
9	7/6/89	7/7/89	22	41.00
10	6/12/89	6/15/89	21	
11	6/20/89	6/28/89	36	
12	6/19/89	6/20/89	6	
12	6/20/89	6/26/89	88	
12	6/20/89	6/27/89	13	
12	7/10/89	7/19/89	58	41.25
13	6/12/89	6/20/89	13	
13	6/19/89	6/30/89	48	
13	7/5/89	7/7/89	67	
13	6/29/89	7/5/89	18	36.50
14	6/1/89	6/12/89	13	
14	6/12/89	6/13/89	85	
14	6/12/89	6/15/89	51	
14	6/12/89	6/16/89	3	
14	7/24/89	7/31/89	12	32.80
15	6/20/89	6/26/89	26	
16				
17	6/12/89	6/21/89	38	
17	6/12/89	6/22/89	5	
17	7/10/89	7/19/89	15	19.33
18	6/12/89	6/21/89	47	
18	6/12/89	6/21/89	28	
18	6/12/89	6/22/89	11	28.67
19	7/24/89	7/26/89	13	
19	8/1/89 —	8/7/89	19	16.00
20	7/6/89	7/8/89	33	
20	7/6/89	7/10/89	5	
20	8/1/89	8/7/89	14	17.33

17 FEMALES PRODUCED 1270 FRY
 FRY / FEMALE = 74.71 AVERAGE FOR PAR POND

ASH BASIN

TANK	DATE COLLECTED	DATE DELIVERED	# FRY	FRY/ FEMALE
1	6/19/89	6/24/89	8	
1	6/12/89	7/10/89	10	
1	7/21/89	7/22/89	2	
1	7/24/89	7/28/89	13	
1	7/24/89	7/31/89	8	8.2
2	6/1/89	6/6/89	4	
3	8/1/89	8/4/89	14	
3	8/1/89	8/7/89	20	17.00
4	6/12/89	6/19/89	10	
4	6/19/89	6/23/89	12	
4	6/12/89	7/8/89	12	11.33
5	7/24/89	7/25/89	15	
6				
7	7/14/89	7/17/89	10	
7	7/26/89	8/1/89	12	11.00
8	6/12/89	7/19/89	13	
8	7/24/89	7/31/89	18	16.00
9				
10	6/24/89	6/29/89	22	
11	7/24/89	7/31/89	4	
11	7/26/89	8/2/89	1	2.5
12	6/12/89	7/9/89	7	
13	6/12/89	6/20/89	14	
13	6/19/89	6/21/89	16	15.00
14	6/12/89	7/9/89	9	
14	8/1/89	8/7/89	3	6.00
15	6/1/89	6/7/89	11	
15	6/12/89	7/8/89	7	8.00
16	7/21/89	7/24/89	11	
17	7/14/89	7/17/89	10	
17	8/1/89	8/4/89	6	8.00
18	6/24/89	7/5/89	5	
19				
20	6/12/89	6/13/89	20	
20	6/12/89	6/15/89	2	
20	7/14/89	7/24/89	5	9.00

16 FEMALES PRODUCED 329 FRY
 FRY / FEMALE = 20.56 FOR ASH BASIN

RISHER POND

TANK #	DATE COLLECTED	DATE DELIVERED	# FRY	FRY/ FEMALE
1	7/14/89	7/31/89	14	
2				
3				
4				
5	7/6/89	7/12/89	18	
6	7/6/89	7/7/89	22	
6	7/21/89	8/1/89	13	17.50
7				
8				
9	8/1/89	8/2/89	31	
10	8/1/89	8/7/89	13	

5 FEMALES PRODUCED 111 FRY
FRY / FEMALE = 22.20

LEBBY'S POND

TANK #	DATE COLLECTED	DATE DELIVERED	# FRY	FRY/ FEMALE
1	6/6/89	6/12/89	21	
1	7/7/89	7/10/89	26	23.5
2	6/20/89	6/29/89	55	
2	7/7/89	7/13/89	5	30.00
3	6/13/89	6/14/89	15	
3	6/13/89	6/14/89	52	
3	6/13/89	6/14/89	8	26.00
4	6/13/89	6/14/89	22	
4	6/13/89	6/15/89	49	35.50
5	6/20/89	6/24/89	23	
5	7/7/89	7/8/89	16	19.50
6	7/12/89	7/21/89	19	
7	6/29/89	7/5/89	45	
8				
9				
10	6/20/89	6/24/89	27	

7 FEMALES PRODUCED 385

FRY / FEMALE = 55 AVERAGE FRY FOR LEBBY'S

LAKE EDGAR BROWN

TANK #	DATE COLLECTED	DATE DELIVERED	# FRY	FRY/ FEMALE
1	6/19/89	6/26/89	8	10.50
1	6/29/89	6/30/89	13	
2	6/29/89	7/4/89	33	16.66
2	6/29/89	7/5/89	15	
2	6/29/89	7/6/89	2	
2	6/29/89	7/18/89	21	
3	6/26/89	7/7/89	56	
4	6/12/89			
5		7/6/89	32	
6	6/26/89	7/7/89	4	
7	6/22/89	6/21/89	43	
8	6/19/89	7/6/89	30	
9	6/26/89	7/7/89	3	
9	6/22/89			
10				

8 FEMALES PRODUCED 210 FRY
 FRY / FEMALE = 26.25

LITTLE SALKEHATCHIE RIVER

TANK #	DATE COLLECTED	DATE DELIVERED	# FRY	FRY/ FEMALE
1	6/20/89	6/21/89	38	
2	6/20/89	6/21/89	15	
3			4	
4	6/29/89	7/12/89		
5			32	
6	7/7/89	7/8/89		
7				
8		7/8/89	8	
9	7/7/89	7/8/89	9	
10	7/7/89			

6 FEMALES PRODUCED 106 FRY
 FRY / FEMALE = 17.67

	Graph A	Graph B	Graph C	Graph D
1	6	0	0	0
2	17	15	23	39
3	0	0	0	0
4	83	0	0	0
5	0	0	0	0
6	2	17	9	9
7	5	0	0	0
8	50	0	0	0
9	35	66	22	0
10	21	0	0	0

11
12
13
14
15

Graph A

38
6
13
61
26

Graph B

0
88
48
85
0

Graph C

0
13
67
51
0

Graph D

0
58
18
3
0

17
18
19
20

Graph A

38
47
13
33

Graph B

5
28
19
5

Graph C

15
11
0
14

Graph D

0
0
0
0

1
2
3
4
5
7
8
9
10

Graph A

21
4
14
10
15
10
13
0
22

Graph B

10
0
20
12
0
12
19
0
0

Graph C

2
0
0
12
0
0
0
0
0

Graph D

8
0
0
0
0
0
0
0
0

	Graph A	Graph B	Graph C	Graph D
11	4	1	0	0
12	7	0	0	0
13	14	16	0	0
14	8	3	0	0
15	11	7	0	0
16	11	0	0	0
17	10	6	0	0
18	5	0	0	0
18	0	0	0	0
20	20	2	5	0

	Graph A	Graph B	Graph C	Graph D
1	14	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	18	0	0	0
6	22	13	0	0
7	0	0	0	0
8	0	0	0	0
9	31	0	0	0
10	13	0	0	0

	Graph A	Graph B	Graph C	Graph D
1	21	28	0	0
2	55	5	0	0
3	15	52	8	0
4	22	48	0	0
5	23	18	0	0
6	19	0	0	0
7	45	0	0	0
8	0	0	0	0
9	0	0	0	0
10	27	0	0	0

1
2
3
4
5
6
7
8
9
10

Graph A

8
33
21
56
0
32
4
43
30
0

Graph B

13
15
0
0
0
0
0
0
3
0

Graph C

0
2
0
0
0
0
0
0
0
0

Graph D

0
0
0
0
0
0
0
0
0
0

1
2
3
4
5
6
7
8
9
10

Graph A	Graph B	Graph C	Graph D
38	0	0	0
15	0	0	0
0	0	0	0
4	0	0	0
0	0	0	0
32	0	0	0
0	0	0	0
0	0	0	0
8	0	0	0
9	0	0	0

and Lake Edgar's Pond. When the research was started during this phase we visited four ponds on SRS Ash Basin, Risher Pond, Par Pond and Scar Face. We were able to collect mature females from all ponds but Scar Face until the last two weeks of the program, even those that we collected didn't survive long enough to give us any fry.

Excellent technical help has been obtained from Voorhees College senior biology major students. These students have help to maintain the health of the rearing tanks throughout the period, have collected the fry as they are born, and analyzed data obtained in observation on these fry. They are able to recognize the mature females well enough to determine if they would delivery fry.

During the month of June and July we received a great deal of rain. In June the normal rain fall is 4.45 inches for 1989 we received a total of 5.59. In July the normal rain fall is 5.45, this year we received a total of 9.41. To me it appeared as if the Gambusias had an extra layer of water to shade them self under. making it very difficult to collect. Because of the level we found it difficult to collect a number of females as compared to the same time as last year. Below is a comparison of Gambusias collected in 1988 to 1989 according to Par Pond and Ash Basin.

Ash Basin		Par Pond	
Collection Date	# Females	Collection Date	# Females
6/17/88	40	7/6/88	70
6/19/89	30	7/14/89	15
6/24/88	100	7/18/88	50
6/24/89	2	7/19/89	20
7/6/88	over 90	7/25/88	25
7/6/89	0	7/24/89	10
7/18/88	40	8/1/88	25
7/20/89	10	8/1/89	9
7/25/88	25		
7/24/89	16		

7/29/88
7/26/89

30
10

As you can see the collection for last summer was better than the summer of 1989.

In checking the written report you will find that the ph and temperature for each pond on SRS has been recorded and one has been recorded for the local ponds.

Our local pond contained a large amount of rain fall also, but what I found about one local pond that was not obvious on last year was the odor. Lebby's Pond is now located a recycling area of waste. Speculation: The effects of the irrigation system has affected the water in the pond. Reason for this speculation is that several fish was spotted flowing upside down.

During this phase we noted also that the size of the females that we collected this year from the pond on SRS were a little different than from last year. The ones from Ash Basin was smaller and delivered less fry than last year and the ones from Par Pond were larger and delivered more fry. Ash Basin was the leading pond for fry delivered on last year but Par Pond delivered more during this phase.

We also compared the distance between each pond that we collected from and they are as follows:

" Risher Pond is visited first, The distance from Risher to Ash Basin is 6 miles; from Ash Basin to Scar Face is 10 miles; the distance from Scar Face to Par Pond is 30 miles; the distance from Par Pond to Lake Edgar is 9 miles; the distance from Lake Edgar to Lebby's Pond is 14 miles; and the distance from Lebby's to Little Salkehatchie River is 6 miles. All of the ponds on SRS are close too each other except for Par Pond.

The college faculty has benefited from the research in that a very exciting area of environmental biology has been

established at an undergraduate school. In addition, the very practical and " real world " value of describing the effects of different pond environments on the development of embryonic fish should lead to valuable information concerning the stability of the total ecosystem on the SRP. The students at Voorhees College has also benefited from the research at the college for they are really able to, at some point, to observe the birth of the new fry and to ask questions about the comparison of live birth in conjunction to those born from the laying of eggs.

The presence of the research project at Voorhees College helps raise the public awareness of activities carried out at an undergraduate liberal arts college that are not normally associated with an institution of that type. Usually environmental and ecological studies are centered at larger universities that devote major efforts toward graduate research and education. Thus, the present project has added substantially to the overall standing of the students, faculty, administration and college in the eyes of the total community. These facts can easily aid in the recruiting students, attracting additional research funds to the institution, and assuring future growth of Voorhees College.

We will continue to collect from the ponds at SRP and only keep the female in the holding tanks for a two week period. If delivery has not occurred within that period of time the females will be discarded from the holding tanks as well as the breeding tanks.

A special note will be made on the females as to the date of collection as well as the date that they delivery.

Phase VI of the Department of Energy Biological Research

began on June 1, 1989 . Gambusias were collected on the following dates from Ash Basin, Risher Pond, Scar Face, and Par Pond:

June 1, 1989	July 14, 1989
June 12, 1989	July 19, 1989
June 19, 1989	July 21, 1989
June 20, 1989	August 1, 1989
June 29, 1989	
July 6, 1989	

Locate pond collections were done on the following dates:

June 6, 1989	July 19, 1989
June 13, 1989	July 21, 1989
June 20, 1989	

ALL LOCATE POND COLLECTION WAS DISCONTINUED AFTER THIS DATE.

During phase VI of the program a total of Gambusias collected from is pond is :

Ash Basin --- 329	Par Pond --- 1270
Risher Pond --- 111	Scar Face --- 0

On the average Par Pond had more fry per individual tank than any of the others.

Ash Basin averaged 20.56 fry / tank

Par Pond averaged 74.71 fry / tank

Risher Pond averaged 22.20 fry / tank

During phase VI the tanks were cleaned once every week.

Air tubing was changed once every two weeks. Holding tanks were cleaned once every three weeks and the air filters were also changed at that time.

From the local ponds the following Gambusias were collected

Lebby's Pond ----385	Salk. River ---106
Lake Edgar Pond ---210	

The average for each pond is listed below.

Lebby's Pond averaged 55.00 fry

Lake Edgar Pond averaged 26.25 fry

Salk. River averaged 17.67 fry

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Research Outline for the Continuation Year

1. To continue to try obtain specimens from Scar Face.
2. To continue to check the ph and temperature as well as the oxygen level of each pond visited.
3. To add chemicals to a small segments of breeding tanks to really see the effects of chemicals on the fry.

END

DATE FILMED

02 / 22 / 91