

Kind.

I. nebulosus - Introduced around Denver

C. velifer - Cache la Poudre near
Greely (CSC) Beardsley.

C. carpio - Boulder Lake - 3 specimens
Greely (CSC)
Look Colo. State Historical +
Nat. Hist. Museum.

Hybognathus nuchalis - Boulder + Longmont
C.U.

Phenacolius mirabilis - Julesberg,
C.U.

N. heterolepis Boulder Creek, Boulder
C.U.

N. horatii Julesberg.

Coccyzus plumbeus ^{check} - Boulder Creek.
St. Vrain Creek.

H. kentuckiensis ✓ St. Vrain Creek.
Boulder Creek
Clear Creek.

H. gracilis phypsignathus - Arkansas

Chrosomus eros } west Plum
Creek, ~~at~~ Boulder
Chrosomus erythrogaster CSC Creek.

Hypopsis

Notropis Biguttata

Pearl dace

C. neogaeus

Found. N. Blennius

CHARACTER ANALYSIS SHEET - COLORADO COOPERATIVE FISHERY UNIT

Species X - Fish Locality Poudre River near College

Collected by _____ Date _____

Cat. # _____ Measurements by _____ Date _____

Specimen #	X	^{a.} anomalum	^{s.} atrance				
Total L.	137	126	142				
Standard L	112	115	118				
Body D	22	22	25				
Head L	32	29	34				
Orbit L	5	5	5				
Upper Jaw L	10	9	13				
Dors. Orig. to Snt. tip	61	54	66				
Dorsal fin basal L	14	12	13				
Dorsal fin depressed L	24	23	24				
Adip. fin depressed L	—	—	—				
Caudal peduncle D	10.5	11	12.5				
Caudal peduncle L	31	33	35				
Vertebrae							
1st Arch gill rakers (up)	17		3				
(lower)	13		8				
(total)	30	29	11	✓			
Branchiostegal rays right		3	3				
(left)		3	3				
Dorsal Rays	8+1	8+1	8+1				
Anal rays	7+1	8+1	8+1	✓			
Pectoral fin rays	17(11P)	13	16(10P)				
Pelvic fin rays	8	8	8				
Scales in lateral line	57	50	64				
Scales above lateral line	9	10	12				
Scales 2 rows above lat.	—	—	—				
Scales 2 rows below lat.	7	8	8				
(around)	39 20	44 20	51 22				
Pyloric caeca	15-41	07-10	21-12				
Dentition	15-41	07-10	24-42				
Anal fin base	10	12	12				
Anal fin depressed	20	21	21				
Dors. Origin - caudal	50	52	51				
P fin - snout	56	52	63				
P fin caudal	55	55	57				
Pre orbital - Post orbital	11/16	11/14	10/19				

Gill Rakers:

↑ Semotilus | x fish
Campostoma

Peritoneum

Semotilus
pale-cream
(no color)

Campostoma
black

X
black.

gut

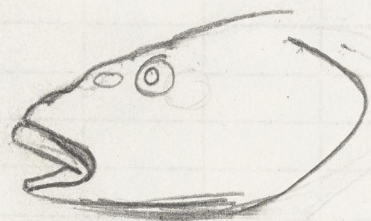
modified
S loop

coiled around
air bladder

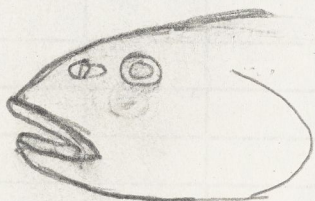
very long +
coiled but irregular
+ not wound around
air bladder



C. anomalum



x. fish



Semotilus

CHARACTER ANALYSIS SHEET

Species Couesius dissimilis, Hybopsis plumbea

Locality Boulder Creek - Juday + Henderson

Cat. # _____ Measurements by _____ Date _____

Total L.	113	77					
Standard L	90	61					
Body D	25	16					
Head L	24	16					
Orbit L	5	4.5					
Upper Jaw L	7	5					
Dors. Orig. to Snt. tip	50	34.5					
Dorsal fin basal L	11	8					
Dorsal fin depressed L	18	13.5					
Adip. fin depressed L	—	—					
Caudal peduncle D	10	6.5					
Caudal peduncle L	25	17					
Vertebrae							
1st Arch gill rakers (up)							
(lower)							
(total)							
Branchiostegal rays right	3	3					
(left)	3	3					
Dorsal Rays	8	8					
Anal Rays	8	7(8)					
Pectoral fin rays	17/16	15/9(5)					
Pelvic fin rays	8/8	8/8					
Scales in lateral line	63	58+3					
Scales above lat. line	12	11					
Scales 2 ^{below} rows above lat.	9	10					
Scales adip. to lat. line	—	—					
Pyloric caeca	—	—					
Dentition	2-1-11	2-1-12					
ANAL fin base	9	6					
" " depressed	13	11					
length D. ORIGIN	44	29					
PFIN - SNOUT	48	32					
PFIN CAUDAL	45	31					
Barbels noted.							

CHARACTER ANALYSIS SHEET

Species Chrosomus erythrogaster

Locality W. PLUM CREEK

Cat. # 334 CU Measurements by H. Li

Date 1/20/67

Total L.	51 mm								
Standard L	41 mm								
Body D	ca 10 mm								
Head L	11 mm								
Orbit L	3.5 mm								
Upper Jaw L	3 mm								
Dors. Orig. to Snt. tip	22.5 mm								
Dorsal fin basal L	4 mm								
Dorsal fin depressed L	10 mm								
Adip. fin depressed L									
Caudal peduncle D	4 mm								
Caudal peduncle L	14 mm								
Vertebrae									
1st Arch gill rakers (up)									
(lower)									
(total)									
Branchiostegal rays right	4								
(left)	4								
Dorsal Rays	8								
Anal Rays	8								
Pectoral fin rays	14/15								
Pelvic fin rays	7/8								
Scales in lateral line	87-92								
Scales above lat. line	—								
Scales 2 rows above lat.	—								
^{scales below} Scales adip. to lat. line	—								
^{scales around} Pyloric caeca	—								
Dentition	?								
Anal fin base	1 mm								
" " depressed	7 mm								
length D. ORIGIN TO	20 mm								
PFIN to snout	22 mm								
PFIN - Caudal fin	21 mm								

scales crowded anteriorly ll hard to see
teeth crumbled - no complete arch.

peritoneum silvery

CHARACTER ANALYSIS SHEET

Species Notropis scylla - Notropis dorsalis + stream

Locality Coal Creek, Lafayette

Cat. # CU

Measurements by _____

Date _____

Total L.	69mm	66mm	—	—
Standard L	50mm	49mm	40mm	43mm
Body D	11mm	10mm	8.5mm	10mm
Head L	15mm	14mm	11mm	11mm
Orbit L	4mm	4mm	3mm	3mm
Upper Jaw L	4mm	5mm	3mm	3mm
Dors. Orig. to Snt. tip	26mm	26mm	20mm	22mm
Dorsal fin basal L	26mm	6mm	5mm	6mm
Dorsal fin depressed L	13mm	13mm	10mm	10mm
Adip. fin depressed L	—	—	—	—
Caudal peduncle D	5	5	5	
Caudal peduncle L	17	18	12	
Vertebrae	4/4			
1st Arch gill rakers (up)				
(lower)				
(total)				
Branchiostegal rays right	4	4	4	4
(left)	4	4	4	4
Dorsal Rays	8	8	8	8
Anal Rays	8	8	7	7
Pectoral fin rays	14/14	14/14	15/15	15/15
Pelvic fin rays	8/8	8/8	8/8	8/8
Scales in lateral line	36	35	37	35
Scales above lat. line	7/6	6/5	6/5	7/5
Scales 2 rows above lat.	39	35	35	40
Scales adip. to lat. line	—	—	—	—
Pyloric caeca	—	—	—	—
Dentition	14-4-1	14-4-1	14-4-0	14-4-0
Dors. Orig. to Caudal F.	26mm	26mm	20mm	21mm
Bill to snout	25	25mm	21mm	20mm
P fin caudal	23.5	25mm	20mm	23mm
anal fin base	6mm	5mm	6mm	5mm
anal fin depressed	9mm	10mm	8mm	8mm

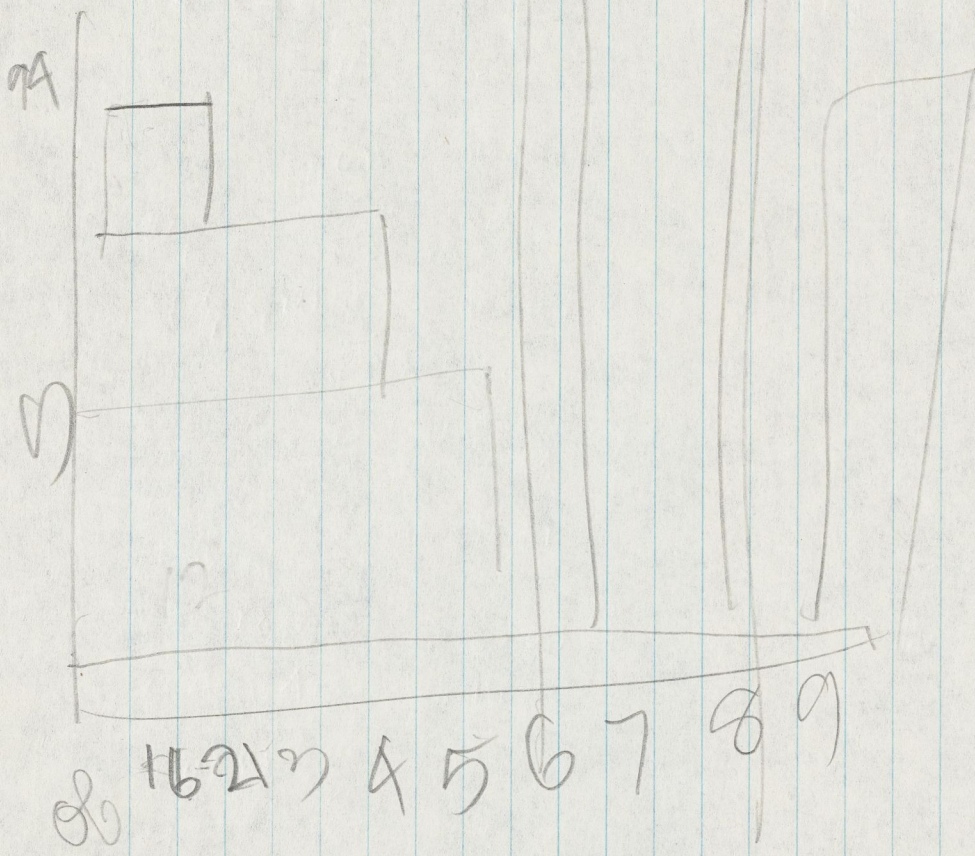
Scales not visible on nape, scrape + find very small scales.

X	3	3	3	2	3	2	2	1	3	2	2	2	2	3	1	2	3	3	
XI	3	3	1	2	1	2	3	2	3	1	3	1	1	2	3	1	2	3	1
XII	3	3	1	2	1	2	3	2	6	3	3	1	2	2	4	1	2	3	2
I	1	3	1	3	1	2	3	1	6	4	1	1	1	2	1	1	1	3	5
	(3)	(3)	(1)	(2)	(1)	(2)	(3)	1/2	3/6	3	(1)	1/2	2	3	(1)	(2)	(3)	3	

IX	1	3	3	3	1	1	2	1	3	3	1	3	1	1	2	2	1	1	2
VIII	1	3	3	3	1	2	2	1	3	1	1	3	1	3	2	2	1	1	1

VI	1	1	3	2	3	2	3	1	1	2	1	1	1	2	4	1	1	3	4
V	1	3	2							2	1	1	1	2		1	1		10
II	1	2	3	2	1	3	1	2	4	2	1	1	1	2	1	1	1	2	2
IV	4	3	2	2	3	2	2	2	4	3	1	1	2	2	1	1	1	2	3
V	2	2	2	1	1	4	1	2	3	2	1	1	1	1	2	1	1	1	2
III	1	2	3	2	1	3	1	2	4	3	1	3	1	2	2	1	1	2	2
III	3	(2)	3	(2)	(1)	3	(1)	(2)	(4)	2/3	(1)	(1)	(1)	(2)	1/2	(1)	(1)	(2)	(2)
VII	3	2	2	2	1	1	2	1	5	3	2	2	1	2	2	1	2	2	2
	3	2	2	1					3	2	2	1	2	2	1	2	2	2	2
	3	2	2	1					2	1	2	2	2	2	1	2	2	2	2

5



CODING FORM

$$\frac{16}{19} = S(i, j)$$

Objects

Characters and Character states

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

C ₁	II	1	2	3	2	1	3	1	2	4	2	1	1	1	2	1	1	1	2	2	
	III																				
C ₅	V	2	2	1	4	2							1	2					1		
	IV	4	3	2	3	2	2				3	2								3	
C ₈	VII	3	2				1	2	1	5	3	2	2				2	2			
	VI			1	3	2	3	1	1					4				3	4		
	XI	3	3	1	2	1	2	3	2	3	1	3	1	1	2	3	1	2	3	1	
	XII									6	3			2	4					2	
	I	1			3				1	6	4	1				1	1			3	
	X			3	3	2	1	2	2	2	2				4					3	
	VIII	1	3	3	3	1	1	2	1	3	3	1	1	1	1	2	2	1	1	2	
	IX	2					2				1	2			3						1

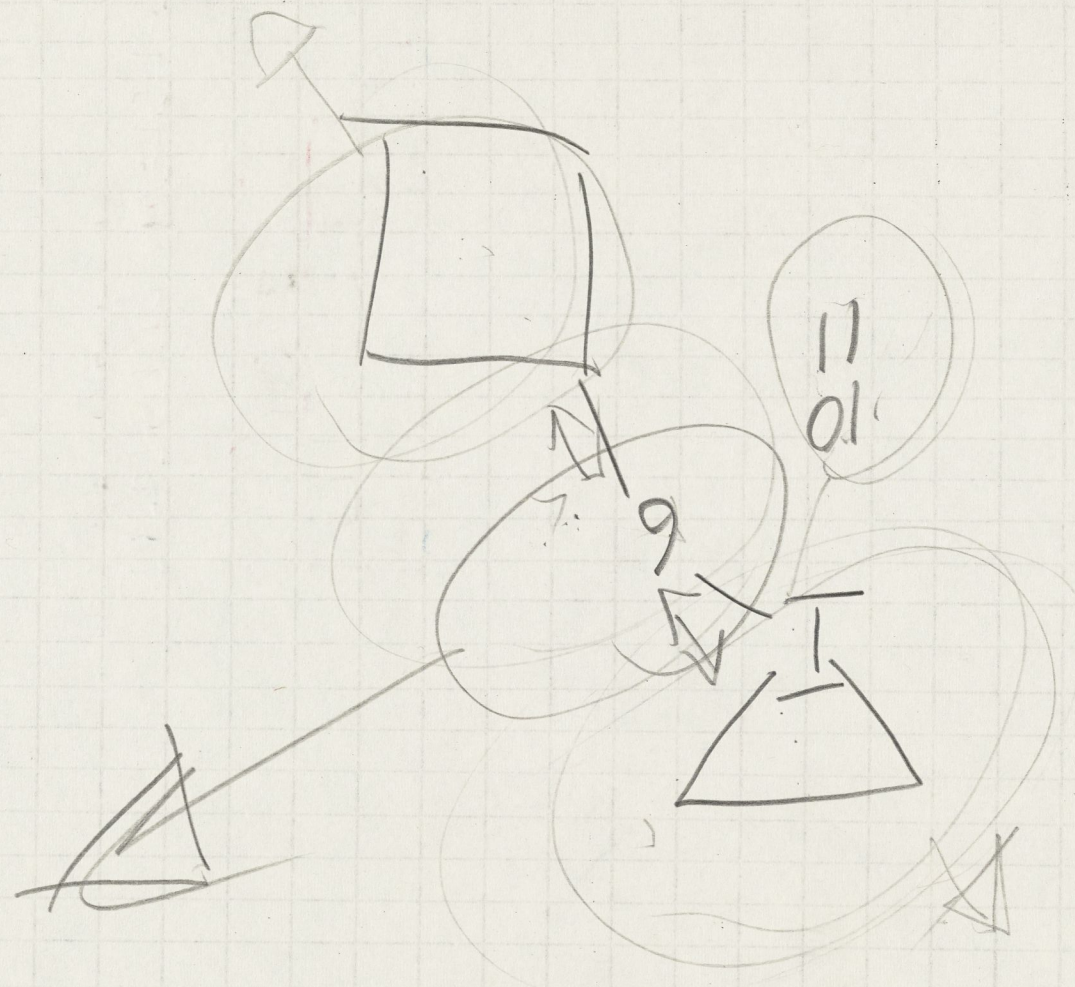


11/11/11

11/11/11

11/11/11

11/11/11



Flatback Notropis

snout to dorsal fin	20	20	n1	23	19	22
snout to anal fin	23	20	n1	25	20	22
orbit to nostril	1	1	1	1	1	1

Bumped Notropis

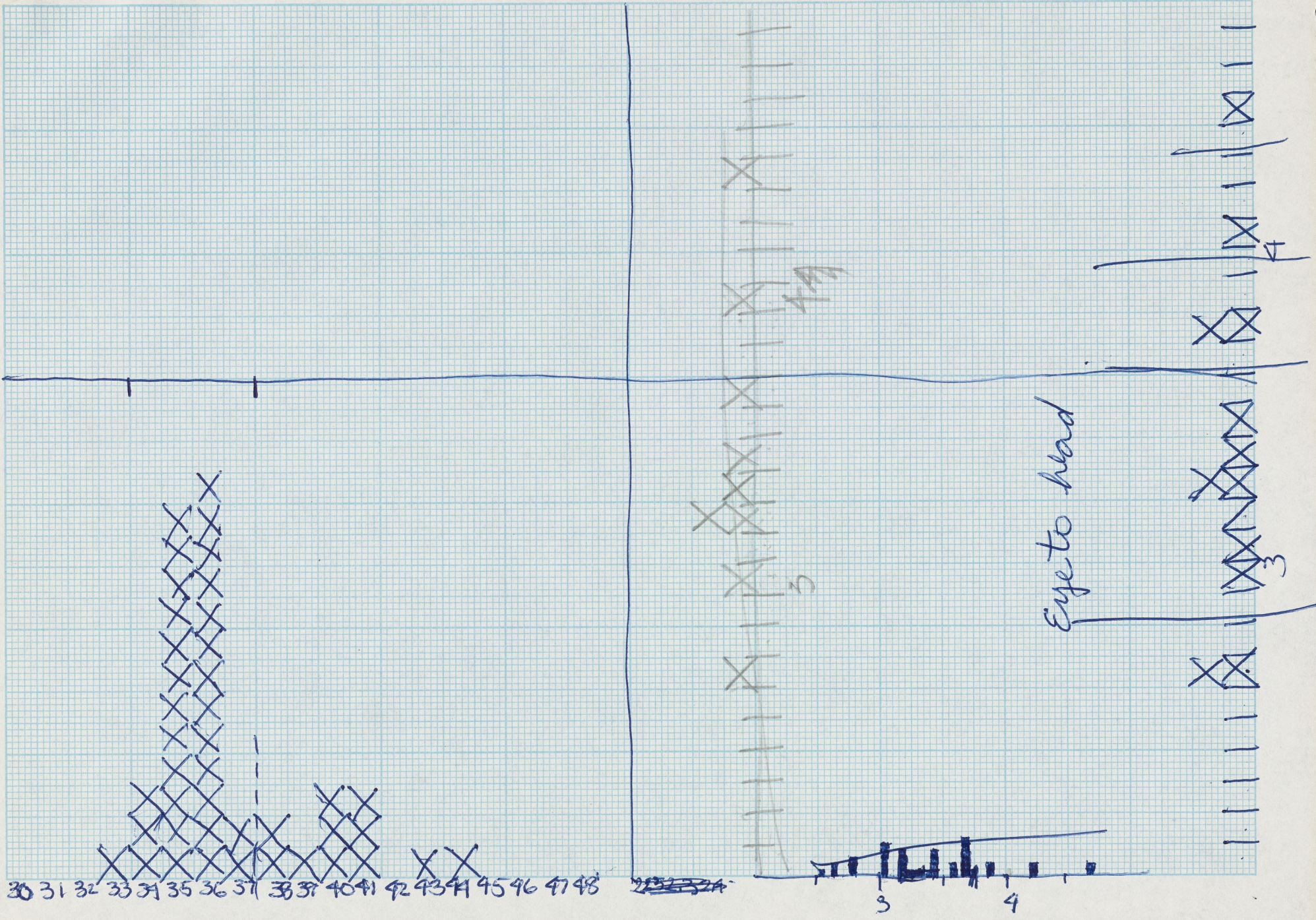
snout to dorsal fin	30	28	26	28	26	30	26
" " anal "	29	27	26	26	26.5	29	25
orbit to nostril	1.5	2	1.5	2	1.5	1.5	1.5

N. Lutrensis

snout to dorsal fin	32	32	27.2	27
" " anal fin	30	29	25	25
orbit to nostril	1	1.2	1	1

N. dorsalis

snout to dorsal fin	26	27	22.5	22
snout " anal fin	24.5	26	22	22
orbit to nostril	1	1	1	1



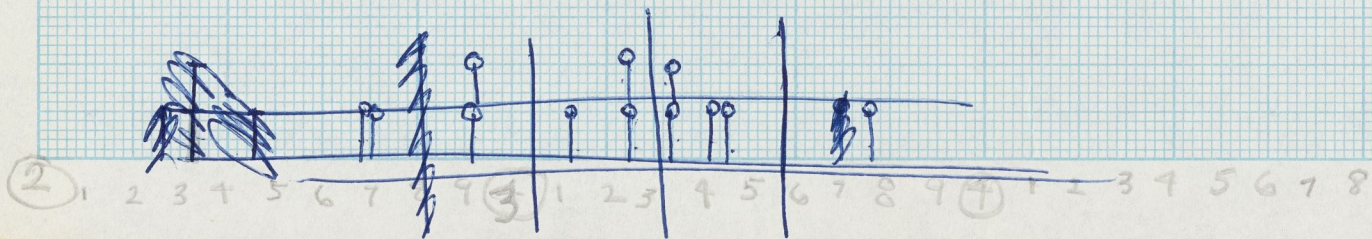
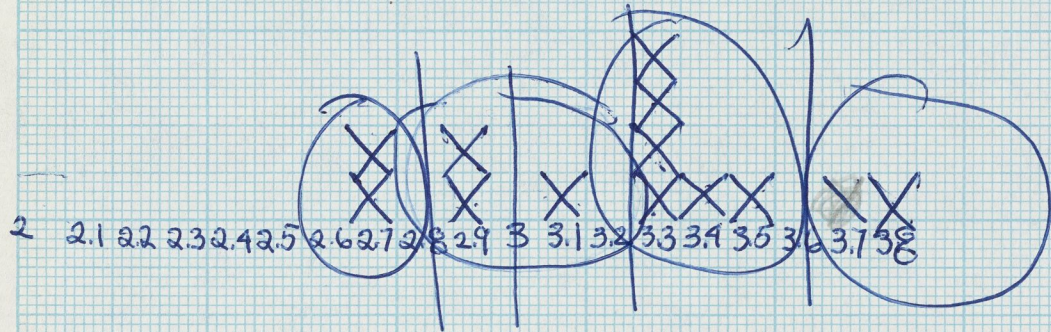
30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48

3 4

Eye to head

3

4



S M

T.L.	64	72	70	59
F.L.	60	70	70	56
S.L.	51	61	57	46
Head	13	16	15	13
eye	4.5	5	5	4
snout	5	4.5	4.5	4
mouth	5	4.5	5	4
H.D.O.	9.5	10.5	10	8.5
H.D.S.	4.5	6	6	5.5
WHO	7	7	7	6
WHS	5	5	5	4.5
width	7-5	7.5-6	6.5	6
depth	12	13	13.5	11.5
L.C.P.	15	20	19	17
DCP	9-6	10-6	10-6	8-5
WC.P	5-2	5-2	5-2	4-2
DF	11	12	12.5	10.5
DB	6.5	8	7.5	7
AF	9	10.5	10	9
AB	6	6	6	5.5

Pre	5	5	5	4
Post	6	7	8	6

D				
A				
P				
V				
ll	35	36	36	36
above	7	7	7	7
below	5	5	5	5
around	29	28	26	26
C. B4 D	31	32	26	29
C. C Redundant	20	17	16	16
S origin → D	26.5	31	29	24
origin D → CP	25	31	29	25
P snout → orig	26	29.5	28	23
P origin Pecl	25	31	29	24
P insert				

LCP
TCP
WCP

"THE CHAMPION LINE" NO. 820-3
CROSS SECTION - 20 SQUARES TO INCH

Stripe distinct
not Cont. X
absent
Blotch + or -
Dark scale for - X
Pigment C.F. +
Pigment last 3

III notropis stramineus stramineus

TL 66 53
FL 60 48
SL 52 41
width 8 7
depth 13 9.5
head 13 11
Eye 5 3
snout 4 4
DF 11 10
DB 6 5
AF 10 7.5
AB 5 4
D 8 8
A 7 7
P 13 14
V 8 8
ll 34 ~~35~~
above ~~7~~ 6
below ~~5~~ 5
around ~~25~~ 25

B+D 15 14
mouth 4 4
H.D.O. 7 7.5
H.D.S 5 4.5
WHO 7 5
WHS 5 4
Scales B.D. 29 26
Scales C.P. 15 15
D.s → o 28 21
D.O → CP 27 21
P.S → o 27 22
P.O → CP 26 20

Pre	4	4
Post	6	6

LCP	17	13
DCP	9.5-5	8-5
WCP	5	5

w.c.p. 6-35-2

stripe { distinct
 not contin. X
 not present

Blotch to - +
 pigment C.F. +
 Pigment last 3
 Dark scale +

Notropis stramine blennioides

TL 42 H.D.O. 12
FL 85 H.D.S 8
SL 74 W.H.O. 9.5
width 10 W.H.S. 8
depth 16 scales B.D. 29
head 20 scales C.P. 16
eye 5 D.S → 0 39
snout 6 D.O → C.P. 37
DF 15 P.S → 0 39
DB 10 P.O → C.P. 37
AF 12 W.C.P. 7.5-3
AB 7
D 8
A 7
P 15
V 8
ll 35
above 6
below 4
around 28
B+D 16
mouth 6
teeth 1, 4, 1
also 1, 4, 4, 2
 2, 4, 4, 1
 2, 4, 4, 2

LCP	20
DCP	13-8
WCP	8

Pre	6
Post	10

stripe not cont.
 Dark scale +
 Blotch +

observations
 V-fing fall way short of anus. all fins seem small.

body

N. dorsalis

TL	55	57	54	53
FL	52	54	50	50
SL	43	45	42	42
width	5.5	6	6	5
depth	9	10	8.5	8
head	12	13	12	12
eye	4	4	3.5	3
snout	5	5	4.5	4
H.D.O.	7	7.5	7.5	7
H.D.S.	5	5	4.5	4.5
WHO	6	6	6	5
WHS	5	5	4.5	4
mouth width	5	5	4	4.5

	57	55	54	
Pre	5	9	4	
Post	6	6	5.5	

depth				
LCP	16	16	15.5	15
DCP	65-45	7-46	4.56-4	
WCP	15-1.5	5-2	5-2A-15	
DF	10	11.5	9.5	9
DB	5	5	5	6
AF	8	8.5	9	7
AB	5.5	5	5	4.5

D
A
P
V

ll	37	36	38	40
above	7	6	6	6
below	6	5	6	6
around	inc	inc	inc	inc

scales B.D.	26	35	29	33
scales C.P.	14	16	17	16
DS → O	22.5	24	22	22
DO → C.P.	23	23	23	21.5
PS → O	22	23	21	22
P.O. → C.P.	23	23	22	22

stripe distinct X

not cont.
absent

Blotch + or - +
Dark scale + or - +
Pigment C.F. +
Pigment 3 rays.

N. Lutrensis

T.L.	70	64	57	61
F.L.	65	59	52	56
S.L.	64	52	45	47
Head	15	14	14	13
Eye	4	3	3	3.5
snout	5	4.5	4	4.5
mouth	5	4.5	4	4.5
H.D.O.	12	12	10	11
H.D.S.	7	5	6	6
WHO	8	6	6	6
WHS	6.5	5	4.5	5
width	8	6	5	6
Depth	19	17	14.5	17
L.C.P.	17	20	15	17.5
D.C.P.	3-7.5	4.5-7	2-6	3.5-6
W.C.P.	6.5-2	5.5-2	4-2	5-2
DF	15	14	15	16
DB	10	7	8	8
AF	13	14	10.5	12
AB	11	9	7	6

D
A
P
V

ll	34	37	39	35
above	6	7	7	7
below	5	5	6	5
around	21	26	27	26
scales D	29	29	28	28
scales C.P.	15	18	18	19
D S → O	31	26	24	26
D O → C.P.	28	27	23.5	24
P S → O	30	24.5	22	23.5
P O → C.P.	27	28	21	24.5

stripes

distinct
not cont.
absent X

Pre	5	4.5	4	4.5
Post	8	7	7	7.5

Blotch top - —
dark scale top - +
Pigment C.F. - —
Pigment 3 rays.

"THE CHAMPION LINE" NO. 820-3
SECTION - 20 SQUARES TO INCH

n. hudsonius

TL 93 101
 FL 72 91
 SL 84 80
 width 10.5 11
 depth 18.5 19
 head 18.5 21.5
 eye 5.5 6.5
 snout 5.5 5
 DF 18 19.5
 DB 10 10.5
 AF 14 16
 AB 8.5 8
 D 00 00
 A 00 00
 P 15 15
 V 8 8
 ll 39 38
 above 7 7
 * below 6 6
 around 29 24
 BT-D 16 16
 mouth 5 5.5
 teeth

MDO 13 15
 HDS 8.5 10
 WHO 10 10.5
 WHS 8 8

LCP	23	22
DCP	14-8	15-9
WCP	9	10

Scales BD 28 29

Scales CP 16 16

D.S → O 38 39.5

P.O → C.P. 37 40

P.S → O 37 41

P.O → C.P. 38 41

W.C.P.

slips	{ distinct	X	
	{ not continuous		X
	{ not present		X
	blotch + or -	+	+
	Pigment C.F.	+	+
	Dark scales	+	+
	Pigment last 3	+	

Post orbital	10	11.5
Pne orbital	5.5	5

Notropis heterolepis

TL	71	53	50	48
FL	64	48	ni	ni
SL	55	42	40	39
width	8	6	6	5
depth	12	9	8	7.5
head	15.5	11	11	9.5
eye	4.5	4	3	3
snout	5	3	4	3
DF	9	9	8.5	9
DB	6	4	5	5
AF	10	8.5	8	7
AB	5.5	4.5	5	4
D	8	8	8	8
A	8	8	8	8
P	14	12	11	
V	8	8	8	8
ll above	36 incomplete			ni
below	5	ni	ni	ni
around	29	25	24	25
before mouth	14	ca 14	14	15
mouth	4	3	3	2

teeth	04-90			
H.D.O.	10	7	7	7
H.D.S.	6	4.5	4.5	4
WHO	7	6	5	6
WHS	5.5	4.5	4	4

LCP	14	10
DCP	7-4	7-4
WCP	5	5

scales BD	28	28	28	28
scales C.P.	21	18	16	18
D 5 → 0	28	21.5	21.5	20
D.O → C.P.	27.5	21	20	19
P. 3. → 0	27.5	21	20	19
P. 0 → C.P.	28	21.5	20	20

stripe { distinct X
 not continuous
 not presence
 blotch + or -
 Pigment C.F. +
 Dark scale +
 WCP 7-35-2 5-25 4-15
 Pigment last 3

Post orbital	16.5	6	5	5
Pre orbital	5	3	4	3

"THE CHAMPION LINE" NO. 820-3
 GROSS SECTION 3 SQUARES TO INCH

Notropis heterodon

<u>T.L.</u>	51	47
<u>F.L.</u>	48	42
<u>S.L.</u>	42	37
<u>width</u>	6	5.5
<u>depth</u>	9.5	9
<u>head</u>	10.5	11
<u>eye</u>	4	4
<u>snout</u>	4	3
<u>DF</u>	11	9.5
<u>DB</u>	5	5
<u>AF</u>	9	7.5
<u>AB</u>	5	4
<u>D</u>	8	8
<u>A</u>	8	8
<u>P</u>	14	14
<u>V</u>	8	8

ll incomplete 34-38 scales in row

<u>above</u>	5	6
<u>below</u>	5	5
<u>around</u>	30	29
<u>B+D</u>	15	15
<u>mouth</u>	3	2.7
<u>teeth</u>	1, 4	4, 1

<u>LCP</u>	14
<u>DCP</u>	7-4.5
<u>WCP</u>	5

<u>HDO</u>	8	6
<u>HDS</u>	4.5	4
<u>WHO</u>	5	5
<u>WHS</u>	3.5	4

<u>Scales</u>	<u>B.D.</u>	30	30
<u>Scales</u>	<u>C.P.</u>	18	18
<u>D</u>	<u>S</u> → <u>O</u>	20	18.5
<u>D</u>	<u>O</u> → <u>C.P.</u>	21.5	18
<u>P</u>	<u>S</u> → <u>O</u>	20	18
<u>P</u>	<u>O</u> → <u>C.P.</u>	21.5	18.5

stripe { distinct X
 not continuous
 not present

blotch + or -
 Pigment C.F. +
 Dark scale +
 w.c.f. 5-2 4.5-2

<u>Pigment last 3</u>	<u>Post orbital</u>	5.5	5.5
	<u>Pre orbital</u>	4	3

"THE CHAMPION LINE" NO. 820-3
 CROSS SECTION 2 SQUARES TO INCH

M. cornutus

TL	101	118	84	78
FL	92	108	76	72
SL	81	99	66	64
Width	12	15.5	11	10
depth	20	29.5	19	16
head	21	25	19	17
eye	5.5	7	5	5.5
snout	7	9	6	5.5
DF	17.5	18.5	15	13.5
DB	9	13	9	8
AF	14.5	18	11	12
AB	8.5	12.5	6	6
D	8	8	8	8
A	8	9	8	9
P	15	17	16	15
V	8	8	8	8
ll	43	41	40	ni
above	7	8	9	8
below	6	7	6	7
around	35	32	34	—
BAD	18	21	24	—
mouth	7	8	6	6
teeth				
HDO	16	18	13	13
HDS	10	11.5	8	8
WHO	10	13	9.5	9
WHS	8.5	10	8	7

LCP	28.5	20
DCP	16-8	13-7
WCP	11	8

"THE CHAMPION LINE" NO. 820-3
CROSSING SQUARES TO INCH

Scales B.D. 42 — — —
 Scales C.P. 17 21 — 16
 D S. → 0.42 47.5 35 32
 D O. → x.P. 42.5 48 35 33
 P S. → 0.41.5 47 35 32
 P O. → x.P. 42 50 35 31
 WCP 9-4 12-4 7.5-3 10-3
 Stripes { distinct
 not continuous X
 not present
 Blotch + or -
 pigment C.F. +
 pigment last 3
 Dark scale ⊕ Post orbital 10 | 12 | 9 | 8
 Pre orbital 7 | 9 | 6 | 5.5

Notropis rubellus

T.L.	67	62	HDO	8	8
FL.	61	57	HDS	6	5
SL	55	49	WHO	6	5
width	8	7	WHS	5	5
depth	11	9	Scales B.D.	—	—
head	13.5	13.5	Scales C.P.	20	19
eye	5	5	DS → O	31	27
snout	5	4.5	DO → C.P.	22.5	22
DF	11	12	PS → O	26.5	25
DB	6	6.5	PO → C.P.	27	24
AF	10.5	11	WCP	6-2	5.5-2
AB	7	7	Stripe	{ distinct	X
D	8	8		{ not present	
A	10	9		{ Blotch + or -	-
P	10	#		{ Pigment C.F.	+
V	8	8		{ pigment last 3	
ll	36	40		{ Dark scale	X
above	8	8	Postorbital	7	6.5
below	4	4	Preorbital	5	4.5
around	28	—			
before	23	21			
mouth	5	5			
teeth	2, 4, 2				
			LCP	18	17
			DCP	8	8
			WCP	6	7

observations

Afin

n. atherinoides

91 82

<u>TL</u>	91	67	85	82
<u>FL</u>	84	ni	77	76
<u>SL</u>	72	53.5	67	67
<u>width</u>	85	65	7	8
<u>depth</u>	15	10	13	12
<u>head</u>	16.5	13	16	16.5
<u>eye</u>	4.5	4	5	4.5
<u>snout</u>	5.5	4	4.5	5.5
<u>DF</u>	15.5	11.5	13	13
<u>DB</u>	7	6	7	5.5
<u>AF</u>	15	11	14	11.5
<u>AB</u>	10	8	9	7.5
<u>D</u>	8	8	8	8
<u>A</u>	11	10	11	9
<u>P</u>	14	12	15	16
<u>V</u>	8	8	8	8
<u>ll</u>	40	41	41	ni
<u>above</u>	8	8	ni	ni
<u>below</u>	4	5	4	ni
<u>around</u>	22	28	28	28
<u>B4-D</u>	17	18	18	18
<u>mouth</u>	5	4	4	4.5
<u>teeth</u>				

<u>HDO</u>	13	10.2
<u>HDS</u>	8	7
<u>WHO</u>	7.5	7
<u>WHS</u>	6	5
<u>scales B.D.</u>	—	—
<u>scales C.P.</u>	17	17
<u>D.S → O</u>	40	35
<u>D.O → CP</u>	39	31
<u>P.S → O</u>	35	33
<u>P.O → CP</u>	38	34
<u>WCP</u>	7-3	6-3

stripes { distinct X
 { not present
 { Blotch + or - +
 { pigment C.F.
 { pigment last 3
 { Dark scale. X
 Pre orbital | 5.5 | 5.5 |
 Post orbital | 9 | 8 |

<u>LCP</u>	20
<u>DCP</u>	10-6
<u>WCP</u>	7.5

CHARACTER ANALYSIS SHEET - COLORADO COOPERATIVE FISHERY UNIT

 Species Catostomus commersoni Locality South Platte River

 Collected by Behnke, Holden, Li, Weber Date _____

 Cat. # CSU 1 Measurements by _____ Date _____

Specimen #	1	2	3	4	5	6	7	8
Total L.	88	92	86	86	82	70	72	
Standard L	71	73	67	66	65	56	55	
Body D	15	17	15	15	15	12	12	
Head L	20	20	20	19	18	16	16	
Orbit L	5	5	4	4	4	4	3	
Upper Jaw L	4	5	5	5	4	3	4	
Dors. Orig. to Snt. tip	37	38	36	35	34	28	28	
Dorsal fin basal L	12	12	11	11	11	9	9	
Dorsal fin depressed L	18	17	19	16	17	14	14	
Adip. fin depressed L	—	—	—	—	—	—	—	
Caudal peduncle D	7	7	7	7	7	6	6	
Caudal peduncle L	15	16	19	19	13	13	12	
Vertebrae								
1st Arch gill rakers (up)	—	—	—	—	—	—	—	
(lower)	—	—	—	—	—	—	—	
(total)	27	25	23	24	21	26	25	
Branchiostegal rays right	3	3	3	3	3	3	3	
(left)	3	3	3	3	3	3	3	
Dorsal Rays	12	11	11	11	12	12	11	
Anal rays	7	8	7	7	7	7	7	
Pectoral fin rays	14:10P	13/10P	15:10P	16:11P	15:10P	15:10P	15:10P	
Pelvic fin rays	9	9	9	9	8	9	9	
Scales in lateral line	55	Ca. 65	Ca. 60	Ca. 58	Ca. 65	Ca. 62	—	
Scales above lateral line							—	
Scales 2 rows above lat.							—	
Scales 2 rows below lat.							—	
(around) C.P.	17	20	19	20	20	17	—	
Pyloric caeca	—	—	—	—	—	—	—	
Dentition	—	—	—	—	—	—	—	
Anal fin base	4	6	5	5	4	4	6	
Anal fin depressed	13	18	13	13	11	10	10	
Dors. Origin - caudal	35	38	34	36	34	29	30	
P fin - snout	41	41	39	39	29	32	31	
P fin caudal	32	33	28	30	29	24	26	
Pre orbital - Post orbital	8/9	9/10	8/9	6/10	9/9	6/7	7/8	

CHARACTER ANALYSIS SHEET - COLORADO COOPERATIVE FISHERY UNIT

Species _____ Locality Hagen's Farm spring

Collected by H. Li + R. Behnke Date _____

Cat. # _____ Measurements by _____ Date _____

Specimen # _____

Total L.	79					
Standard L	62					
Body D	15					
Head L	16					
Orbit L	4					
Upper Jaw L	4					
Dors. Orig. to Snt. tip	31					
Dorsal fin basal L	7					
Dorsal fin depressed L	8					
Adip. fin depressed L	—					
Caudal peduncle D	8					
Caudal peduncle L	12.5					
Vertebrae						
1st Arch gill rakers (up)	?					
(lower)	8					
(total)	8+					
Branchiostegal rays right	3					
(left)	3					
Dorsal Rays	8					
Anal rays	8					
Pectoral fin rays	10P(5)					
Pelvic fin rays	8P					
Scales in lateral line	40					
Scales above lateral line	5					
Scales 2 rows above lat.	—					
Scales 2 rows below lat.	6					
(around) ca	34					
Pyloric caeca	—					
Dentition	09-40					
Anal fin base	6					
Anal fin depressed	11					
Dors. Origin - caudal	33					
P fin - snout	39					
P fin caudal	31					
Pre orbital - Post orbital	5/8					

yellow color
fin not falcate.

CHARACTER ANALYSIS SHEET - COLORADO COOPERATIVE FISHERY UNIT

Species Semotilus atromaculatus Locality S. Platte River near Kersey,

Collected by Behnke, Weber, Holden, Li Date _____

Cat. # _____ Measurements by H. Li Date March 29, 1968

Specimen # _____

Total L.	70						
Standard L	55						
Body D	12						
Head L	17						
Orbit L	4						
Upper Jaw L	6						
Dors. Orig. to Snt. tip	32						
Dorsal fin basal L	7						
Dorsal fin depressed L	11						
Adip. fin depressed L	—						
Caudal peduncle D	6						
Caudal peduncle L	17						
Vertebrae							
1st Arch gill rakers (up)							
(lower)							
(total)							
Branchiostegal rays right	3						
(left)	3						
Dorsal Rays	8						
Anal rays	8						
Pectoral fin rays	16						
Pelvic fin rays	8						
Scales in lateral line	Ca. 58						
Scales above lateral line							
Scales 2 rows above lat.							
Scales 2 rows below lat.							
(around)							
Pyloric caeca							
Dentition							
Anal fin base							
Anal fin depressed							
Dors. Origin - caudal							
P fin - snout							
P fin caudal							
Pre orbital - Post orbital							

16. STRIPE

1. up around snout 2. up to post temporal 3. incomplete 4. absent

17. SNOUT

1. with a lump at nostril
2. with a slight lump
3. short and roundly blunt
4. straight

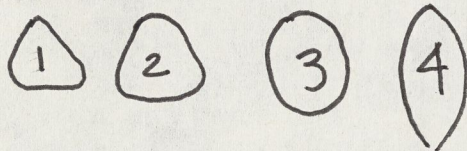
18. CHIN

1. straight 2. curved up 3. sharply curved

19. TOP OF HEAD

1. round 2. gently rounded 3. flat

20. SHAPE



	1	2	3	4
1	1	hatched	hatched	hatched
2	.80	1	hatched	hatched
3	.30	.35	1	hatched
4	.20	0	0	1

21. SCALES ON BREAST

1. present 2. absent

22. MOUTH/HEAD

1. 38-41 2. 35-37 3. 32-34 4. 29-30 5. 25-27 N=5

K=2

23. ^{width} MOUTH/DEPTH

1. 73-78 2. 67-70 3. 57-63 4. 51-52 5. 35 N=4

K=1

24. DEPTH/STANDARD LENGTH

1. 32-36 2. 18-28

25. LENGTH CAUDAL PEDUNCLE/STANDARD LENGTH

1. 25-28 2. 30-33 3. 37-35 N=3

K=1

26. DEPTH CAUDAL PEDUNCLE/DEPTH

1. 31-35 2. 39-41 3. 43-44 4. 47-53 5. 56 N=5

K=1

27. DEPTH CAUDAL PEDUNCLE/LENGTH CAUDAL PEDUNCLE

1. 44-47 2. 40-41 3. 34-38 25-32 N=4

K=1

28. WIDTH BEFORE ANAL FIN/LENGTH CAUDAL PEDUNCLE

1. 27-33 2. 35-39 3. 40 4. 46-50 N=4

k=1

29. DORSAL FIN/DORSAL BASE

1. 22-24 2. 20 3. 19-18 4. 17 5. 15 N=5

K=1

30. PREORBITAL/POSTORBITAL

1. 54-67 2. 66-67 3. 69-80 N=0

K=0

31. EYE TO HEAD

- "& 1. 2.7 2. 2.9-3.5 3. 3.8-4 4. 4.4

①

	59	58	55	53	
TL-FL	5	∅	5	3	✓
TL-SL	13	13	13	12	✓
mouth head	.286	.336	.320	.293	✓ (1)
width depth	.667	.667	.688	.60	✓ (2)
width length	.152	.133	.131	.146	✓ (3)
depth length	.239	.20	.190	.244	✓ (4)
LCP length	.348	.322	.310	.317	✓ 3
$\frac{DCP_1}{D} \circ \frac{DCP_2}{D}$	.5	889:556	915:562	.65:40	✓
$\frac{DCP_1}{LCP} \circ \frac{DCP_2}{LCP}$	5:341	552:345	570:346	.5:308	✓
wcp/LCP	.313	.345	.384	.302	✓
DF/DB	1.846	1.667	1.70	1.75	✓
AF/AB	1.889	1.80	2.00	2.00	✓
Pre/Post	.643	.615	.583	.583	
HDO-NDS	1.5	2.5	2	1.5	
WNG-WHS	2	2	2	2	

2

	(64)	(59)	
TL-FL	4	3	
TL-SL	13	13	
mouth/head	.385	.308	✓
width/depth	.583	.522	✓
width/s.L.	.137	.130	✓
depth/s.L.	.235	.250	✓
L.C.P./s.L.	.299	.370	.327 / .333 ✓
$\frac{DCP_1}{D} \circ \frac{DCP_2}{D}$	.61 \circ .500	.65 \circ .435	✓
$\frac{DCP_1}{LCP} \circ \frac{DCP_2}{LCP}$	.60 \circ .40	.471 \circ .299	.5 \circ .3 / .526 \circ .316
WCP/LCP	.333	.235	✓
DF/DB	1.69	1.50	✓
AF/AB	1.33	1.64	1.40 / 1.75
Pre/Post	.833	.667	.625 / .714
HDO-HDS	4	3	4.5 / 4
WHO-WHS	2	2.5	2 / 2

(3)

(4)

(66)

(53)

(92)

blennius

TL-FL	6	6	7
TL-SL	8	7	18
Mouth head width	.308	.363	.30 ✓
Depth width	.615	.737	.625 ✓
S.L. Depth	.154	.171	.135 ✓
S.L.	.25	.268	.216 ✓
LCP S.L.	.327	.317	.270 ✓
$\frac{DCP_1}{D} : \frac{DCP_2}{D}$	.385	.526	.500 ✓
$\frac{B}{P} : \frac{DCP_2}{LCP}$	.294	.385	.400 ✓
WCP/LCP	.394	.385	.400 ✓
DF/DB	1.83	1.83	1.5 ✓
AF/AB	2.00	1.87	1.71 ✓
Pne/Post	.667	.667	.60
HDO-HDS	2	3	4
WHO-WHS	2	1	1.5

5

n. dorsalis

	(55)	(57)	(59)	
TL-FL	3	3	4	
TL-SL	12	12	12	
mouth/head	.417	.385	.333	✓
width/depth	.611	.600	.706	✓
width/s.l.	.128	.133	.143	✓
depth/s.l.	.209	.222	.202	✓
LCP/s.l.	.372	.356	.369	✓
DCP/s.l.	.500	.400	.529	✓
DCP/LCP	.281	.25	.290	✓
WCP/LCP	.281	.312	.325	✓
DF/DB	2	2.3	.190	✓
AF/AB	1.45	1.70	1.80	✓
Pre/Post	.666	.833	.727	✓
HDO-HDS	2	1.5	3	
WHO-WHS	1	1	1.5	

(6)

N. lutrensis

	(57)	(6)	
TL-FL	5	5	
TL-SL	12	14	
mouth/head	.286	.346	✓
width/depth	.345	.352	✓
width/s.l.	.411	.426	✓
depth/s.l.	.322	.361	✓
LCP/s.l.	.333	.371	✓
DCP ₂ /D	.414	.353	✓
DCP/LCP	.400	.343	✓
WCP/LCP	.267	.286	✓
DF/DB	1.87	2.00	✓
AF/AB	1.5	2	✓
Pre/post	.571	.600	✓
HDO-HDS	4	5	
WHO-WHS	1.5	1	

7

M. hudsonius

	93	101
TL-FL	ni	10
TL-SL	9	21
mouth/head	.270	.256 ✓
width/depth	.568	.579 ✓
width/s.l.	.725	.138 ✓
depth/s.l.	.220	.238 ✓
LC P/length	.274	.275 ✓
DCP ₂ /D	.432	.474 ✓
DCP ₂ /lcp	.348	.409 ✓
WCP/lcp	.391	.455 ✓
DI-/DB	1.80	1.86 ✓
AI-/AB	1.65	2.00 ✓
Pre-/Post	.55	.435
HDO-HDS	4.5	5
WNO-WNS	2	2.5

8

N. heterolepis

	(53)	(50)	
TL-FL	5	3	
TL-SL	11	10	
mouth head	.273	.273	✓
width depth	.666	.75	✓
width/S.L.	.143	.150	✓
depth/S.L.	.214	.200	✓
LCP/S.L.	.333	.250	✓
DCP ₂ /D	.444	.500	✓
DCP ₂ /LCP	.286	.400	✓
WCP/LCP	.357	.500	✓
DF/DB	2.35	1.7	✓
AF/AB	1.89	1.60	
Pne/Post	.50	.80	
HDO-WHS	2.5	2.5	

9. M. heterodon

	(51)	47	
TL-FL	3	4	X
TL-SL	6	5	
mouth head	.285	.245	✓
width/depth	.632	.611	✓
width/s.l.	.143	.149	✓
depth/s.l.	.226	.243	✓
LCP/s.l.	.333		✓
DCP ₂ /D	.474		✓
DCP ₁ /LCP	.321		✓
WCP/LCP	.357		✓
DF/DF	2.20	1.90	✓
AF/AB	1.80	1.88	✓
Pne/Post	.727	.545	
#DO-HDS	3.5	2	
WHO-WHS	2.5	2	

10

N. cornutus

101

84

TL-FL	9	8	
TL-SL	20	18	
mouth/head	.333	.316	✓
width/depth	.600	.579	✓
width/S.L.	.120	.166	✓
depth/S.L.	.247	.288	✓
LCP/S.L.	.352	.312	✓
DCP ₂ /D	.400	.438	✓
DCP ₁ /LCP	.281	.350	✓
WCP ₁ /LCP	.385	.400	✓
DF/DB	1.94	1.67	✓
AF/AB	1.71	1.83	
Pre/Post	.700	.667	
NDO-HDS	4	5	
WNO-WHS	1.5	1.5	

(11)

N. rubellus

	(67)	(62)	
TL-FL	6	5	
TL-SL	12	13	
mouth head width/depth	.370	.370	✓
	.727	.778	✓
width/S.L.	.745	.143	✓
depth/S.L.	.200	.200	✓
L.C.P./S.L.	.328	.346	✓
DCP ₂ /D	.727	.890	✓
DCP ₁ /LCP	.445	.470	✓
WCP ₁ /LCP	.374	.398	✓
DF/DB	1.83	1.85	✓
AF/AB	1.50	1.57	
Pre/Post	.714	.692	
HDO-HDS	2	2	
WHO-WHS	1	0	

(12)

n.

antherinoides

(82)

TL-FL	6	
TL-SL	15	
mouth/head	.273	✓
width/depth	.750	✓
width/s.l.	<u>.119</u>	✓
depth/s.l.	.179	✓
L.C.P./s.l.	.299	✓
DCP ₂ /LCP	.500	✓
DCP ₁ /LCP	.300	✓
WCP ₁ /LCP	.375	✓
DF/DB	2.36	✓
AF/AB	1.53	
HDO-HDS	3	
WHD-WHS	2	

Dark scale:

ascalous chest

ascalous chest + abdomen

stripe { complete
incomplete
absent

pigment C.F.

- 1) determine collection see if there are distinct locals of N. d. dorsalis and N. d. piptolepis
- 2) check for evidence of N. s. missouriensis, N. s. stramineus
- 3) See if the hump difference is not merely an allometric phenomenon.

$$\frac{\text{Snout length}}{\text{Postorbital}} = 1.5$$