

US EPA ARCHIVE DOCUMENT



2002071

MRID No. 417203-02

## DATA EVALUATION RECORD

1. **CHEMICAL:** Propiconazole.  
Shaughnessey No. 122101.
2. **TEST MATERIAL:** Propiconazole (CGA-64250); Lot No. 850083;  
91.7% active ingredient; an amber-colored viscous liquid.
3. **STUDY TYPE:** Freshwater Fish, Early Life-Stage, Flow-Through  
Toxicity Test. Species Tested: Fathead Minnow (*Pimephales  
promelas*).
4. **CITATION:** Surprenant, D.C. 1987. The Toxicity of CGA-  
64250 (Propiconazole) to Fathead Minnow (*Pimephales  
promelas*) Embryos and Larvae. Study No. 87-8-2476.  
Prepared by Springborn Life Sciences, Inc., Wareham, MA.  
Submitted by Ciba-Geigy Corporation, Greensboro, NC. EPA  
MRID No. 417203-02.
5. **REVIEWED BY:**

<p>Louis M. Rifici, M.S. Associate Scientist KBN Engineering and Applied Sciences, Inc.</p>	<p>Signature: <i>Louis M. Rifici</i> Date: <i>7/10/92</i></p>
<p>Pim Kosalwat, Ph.D. Senior Scientist KBN Engineering and Applied Sciences, Inc.</p>	<p>Signature: <i>Kathryn T. Valentino</i> Date: <i>7/13/92</i></p>
<p>Henry T. Craven, M.S. Supervisor, EEB/EFED USEPA</p>	<p>Signature: <i>Henry T. Craven</i> Date: <i>7/22/92</i></p>
7. **CONCLUSIONS:** This study is not scientifically sound and  
does not meet the guideline requirements for a flow-through,  
early life-stage toxicity test using fathead minnows. The  
relative standard deviation for fish weight in one of the  
control replicates (55%) was unacceptable. Under the  
conditions of the test, the MATC was >0.12 and <0.21 mg/l  
mean measured concentrations, based on significantly reduced  
larval length and weight (geometric mean MATC = 0.16 mg/l).
8. **RECOMMENDATIONS:** N/A
9. **BACKGROUND:**

**10. DISCUSSION OF INDIVIDUAL TESTS: N/A.****11. MATERIALS AND METHODS:**

- A. **Test Animals:** Fertilized fathead minnow (*Pimephales promelas*) embryos were obtained from in-house cultures.
- B. **Test System:** An intermittent-flow proportional diluter (after Mount and Brungs, 1967) with a dilution factor of 50% was used. Diluter stock solutions (56 mg a.i./ml) were prepared every 14 days by dissolving the test material in acetone. The stock was injected into the diluter mixing chamber resulting in a high test concentration of 1.0 mg/l. The mixing chamber solution was proportionally diluted to prepare the lower test concentrations.

The diluter delivered test solution to each replicate test aquarium at a rate of 6 volume replacements per day. The test aquaria were impartially positioned in a temperature-controlled water bath ( $25 \pm 1^\circ\text{C}$ ) and illuminated (26-80 ft-candles) with fluorescent tubes on a 16-hour light photoperiod. Each glass aquarium measured 39 x 20 x 25 cm with a 19-cm high side drain (solution volume of 15 l). The diluter was allowed to equilibrate for three days prior to test initiation.

The egg incubation cups were glass jars (5 cm O.D., 8 cm high) with the bottoms replaced with 40-mesh Nitex® screen. Renewal of the solution in the egg cups was assured using a rocker-arm apparatus which gently oscillated the cups.

Well water which was supplemented with Town of Wareham untreated well water was used as dilution water. The water was aerated and stored in an epoxy-coated concrete reservoir and had a hardness, alkalinity, pH, and specific conductance of 30-36 mg/l as  $\text{CaCO}_3$ , 28-34 mg/l as  $\text{CaCO}_3$ , 7.0-7.1, and 100-120  $\mu\text{mhos/cm}$ , respectively.

- C. **Dosage:** Thirty-five-day flow-through test. Based on preliminary testing, five nominal concentrations (0.063, 0.13, 0.25, 0.50, and 1.0 mg/l), a solvent control (18  $\mu\text{l}$  acetone/l), and a dilution water control were used.
- D. **Design:** Sixty embryos were impartially selected and transferred to each of 14 egg cups, one cup per

aquarium. Two replicate aquaria were used per concentration, control, and solvent control.

Dead embryos were counted daily until hatching was complete. The percent survival at hatch was determined based on the "number of live larvae and embryos per incubation cup after hatching was completed compared to the number of embryos per cup on test day 0." When no more than 5 unhatched, viable embryos remained in each cup, hatch was considered complete. On day 4, 40 live larvae were impartially selected from the cup and placed into their respective test aquaria.

Larvae were offered brine shrimp nauplii three times daily on weekdays and twice daily on weekends and holidays. The aquaria were cleaned of excess food and fecal material when necessary. The behavior and appearance of the larvae were recorded daily. Larval survival was assessed twice weekly. At the end of the test (31 days post-hatch), the percent survival was determined and the fish were weighed (wet) and individually measured.

Temperature, dissolved oxygen concentration (DO), and pH were measured at test initiation in all test aquaria and every day in alternating replicates of each level for the remainder of the test. Hardness was measured on day 0 and weekly thereafter in alternating replicates of the control, solvent control, lowest, and highest test levels.

Samples of the test solutions (each aquarium) were taken on test days 0, 4, 11, 18, 25, 32, and 35 for determination of the concentration of propiconazole by high pressure liquid chromatography (HPLC). On day 21, the low, middle, and high concentrations were resampled.

- E. **Statistics:** For each endpoint, the dilution water control and solvent control data were compared using one-way analysis of variance (ANOVA). Embryo survival, post-hatch survival, total length, and wet weight data were analyzed. The arcsine square root transformation was used on the survival at hatch and survival at termination data. Analysis of variance with a subsequent comparison of means procedure (Williams' test) were used to determine any significant differences between the exposure groups and the pooled controls. All statistical conclusions were made at  $p \leq 0.05$ .

12. **REPORTED RESULTS:** No visible signs of undissolved test material were noted in the test solutions. The mean measured concentrations for the 35-day test were 0.069, 0.12, 0.21, 0.43, and 0.97 mg/l (Tables 2 and 3, attached). These values represent 110, 92, 84, 86, and 97% of nominal concentrations (Table 3, attached). "A minor diluter system malfunction, detected and corrected on day 18 of the exposure period, was responsible for the modest decrease in measured concentrations at that sampling interval."

Embryo survival and fry survival data are summarized as percentages in Table 4 (attached). The number of embryos successfully hatched in the exposure concentrations was not significantly different from the pooled controls. However, the survival of larvae at the highest test concentration was significantly reduced when compared to the pooled control. The mean lengths and weights of larvae exposed to 0.97 mg/l were significantly lower than the pooled control (Table 4, attached). No sublethal effects were observed in this test.

Summarized water quality measurements are given in Table 1 (attached). Mean DO ranged from 6.2 to 7.5 mg/l and the pH was 6.6-7.3. The mean temperature was 24°C.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:** Based on significantly reduced larval survival and growth at 0.97 mg/l, the maximum acceptable toxicant concentration (MATC) for fathead minnows was >0.43 mg/l and <0.97 mg/l. The geometric mean MATC was 0.65 mg/l.

Quality Assurance and Good Laboratory Practices Compliance Statements were included in the report, indicating that the study was conducted in accordance with EPA Good Laboratory Practice regulations except in the case of the characterization and verification of the test substance identity.

14. **REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:**

- A. **Test Procedure:** The test procedures were generally in accordance with the SEP or ASTM (1987), except for the following:

The relative standard deviation (RSD) for fish weight of replicate 2 of the solvent water control was 55%. The RSD for growth in any control replicate must be less than 40% for a test to be considered valid.

ASTM (1987) suggests that the embryonic stage at the beginning of the exposure be determined as precisely as

possible. The precise embryonic stage was not determined in this study.

The SEP states that a minimum of 4 replicates with 20 embryos each should be used. ASTM allows a minimum of 2 replicates with 40 embryos each. This study followed the ASTM protocol and used 60 embryos per replicate.

The report did not indicate whether food was withheld from the fish during the last 24 hours of the test. The SEP recommends discontinuing feeding at least 24 hours prior to test termination.

The accuracy of the flow-splitting mechanism used to deliver the test solution to the replicate aquaria should be checked frequently during the exposure. The report does not state if the accuracy of the mechanism was checked.

- B. Statistical Analysis: The reviewer analyzed survival at hatch and at termination following arcsine square root transformation. Survival at hatch data met the assumptions of normality and homogeneity of variances and were analyzed using one-way ANOVA (Toxstat Version 3.3). Survival at termination data did not meet the homogeneity of variance assumption and were analyzed using the Kruskal-Wallis test. The test material had no effect on survival (printouts 1 and 2, attached).

The length and weight raw data were analyzed using two-way ANOVA and Bonferroni's test (Crunch Version 3). Compared to the solvent control, only growth at the highest concentration, 0.97 mg/l, was significantly affected (printouts 3-6, attached). However, compared to the dilution water control, growth at concentrations  $\geq 0.21$  mg/l was significantly decreased.

- C. Discussion/Results: The weights of solvent control fish in replicate 2 had a RSD of 55%. This RSD is too high to consider the test acceptable and may indicate that unidentified stress was present during the test. The highest concentration of acetone used (18  $\mu$ l/l) was present in the solvent control and 0.97 mg/l mean measured test concentration. Survival in these two levels was 89 and 73%, respectively. Survival in all other levels was 94 to 100%. Length and weight of solvent control fish was lower than dilution water control fish. Though the maximum solvent concentration was lower than the guideline recommended maximum, the growth and survival of the fish appears to

have been affected by the acetone in the solvent control and 0.97 mg/l groups.

Since acetone appeared to affect the test organisms and the four lowest concentrations contained less acetone, the data from these treatment levels should be compared to those of the dilution water control.

This study is not scientifically sound and does not meet the guideline requirements for a flow-through, early life-stage toxicity test for fathead minnows. The relative standard deviation for fish weight in one of the control replicates (55%) was unacceptable. Under the conditions of the test, the MATC was  $>0.12$  and  $<0.21$  mg/l mean measured concentrations, based on the most sensitive biological parameters, larval length and weight (geometric mean MATC = 0.16 mg/l).

**D. Adequacy of the Study:**

- (1) **Classification:** Invalid.
- (2) **Rationale:** The relative standard deviation for fish weight in one of the control replicates (55%) was unacceptable.
- (3) **Repairability:** No.

**15. COMPLETION OF ONE-LINER FOR STUDY:** Yes, 06-26-92.

**REFERENCE:** ASTM. 1987. Proposed new standard guide for conducting early life-stage toxicity tests with fishes. Draft No. 12.

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Pages 7 through 10 are not included in this copy.

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417203-02, PROPICONAZOLE, SURVIVAL AT HATCH  
 File: A:41720302.FHM Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro Wilks test for normality  
 Data PASS normality test at P=0.01 level. Continue analysis.

Bartlett's test for homogeneity of variance  
 Data PASS homogeneity test at 0.01 level. Continue analysis.

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	0.046	0.008	0.476
Within (Error)	7	0.114	0.016	
Total	13	0.160		

Critical F value = 3.87 (0.05,6,7)  
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	SOLVENT CONTRL	1.246	0.890		
2	DILUTION CONTRL	1.178	0.850	0.529	
3	0.069	1.251	0.900	-0.039	
4	0.12	1.114	0.805	1.030	
5	0.21	1.224	0.880	0.166	
6	0.43	1.137	0.815	0.853	
7	0.97	1.104	0.785	1.110	

Dunnett table value = 2.82 (1 Tailed Value, P=0.05, df=7,6)

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	SOLVENT CONTRL	2			
2	DILUTION CONTRL	2	0.298	33.5	0.040
3	0.069	2	0.298	33.5	-0.010
4	0.12	2	0.298	33.5	0.085
5	0.21	2	0.298	33.5	0.010
6	0.43	2	0.298	33.5	0.075
7	0.97	2	0.298	33.5	0.105

417203-02, PROPICONAZOLE, SURVIVAL AT TERMINATION  
 File: A:41720302.DT2 Transform: ARC SINE(SQUARE ROOT(Y))

t-test of Solvent and Blank Controls

Ho:GRP1 MEAN = GRP2 MEAN

GRP1 (SOLVENT CTRL) MEAN =	1.2381	CALCULATED t VALUE =	-3.0799
GRP2 (BLANK CTRL) MEAN =	1.4603	DEGREES OF FREEDOM =	2
DIFFERENCE IN MEANS =	-0.2222		

TABLE t VALUE (0.05 (2), 2) = 4.303 NO significant difference at alpha=0.05  
 TABLE t VALUE (0.01 (2), 2) = 9.925 NO significant difference at alpha=0.01

Shapiro Wilks test for normality  
 Data PASS normality test at P=0.01 level. Continue analysis.

Hartley test for homogeneity of variance.  
 Bartlett's test for homogeneity of variance  
 These two tests can not be performed because at least one group has zero variance.  
 Data FAIL to meet homogeneity of variance assumption.  
 Additional transformations are useless.

KRUSKAL-WALLIS ANOVA BY RANKS - TABLE 1 OF 2 (p=0.05)

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	RANK SUM
1	SOLVENT CTRL	1.238	0.890	7.500
2	DILUTION CTRL	1.460	0.990	21.500
3	0.069	1.460	0.990	21.500
4	0.12	1.324	0.940	11.000
5	0.21	1.387	0.965	15.500
6	0.43	1.492	1.000	25.000
7	0.97	1.031	0.730	3.000

Calculated H Value = 11.875 Critical H Value Table = 12.590  
 Since Calc H < Crit H FAIL TO REJECT Ho:All groups are equal.

DUNNS MULTIPLE COMPARISON - KRUSKAL-WALLIS - TABLE 2 OF 2 (p=0.05)

GROUP	IDENTIFICATION	TRANSFORMED MEAN	ORIGINAL MEAN	GROUP						
				0	0	0	0	0	0	0
7	0.97	1.031	0.730	7	1	4	5	2	3	6
1	SOLVENT CTRL	1.238	0.890	.	.	.	.	.	.	.
4	0.12	1.324	0.940	.	.	.	.	.	.	.
5	0.21	1.387	0.965	.	.	.	.	.	.	.
2	DILUTION CTRL	1.460	0.990	.	.	.	.	.	.	.
3	0.069	1.460	0.990	.	.	.	.	.	.	.
6	0.43	1.492	1.000	.	.	.	.	.	.	.

\* = significant difference (p=0.05)  
 Table q value (0.05,7) = 3.038

. = no significant difference  
 SE = 4.109

TITLE: 417203-02, PROPICONAZOLE, SURVIVAL AT HATCH  
 FILE: A:41720302.FM  
 TRANSFORM: ARC SINE(SQUARE ROOT(Y))

NUMBER OF GROUPS: 7

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	SOLVENT CONTRL	1	0.9500	1.3453
1	SOLVENT CONTRL	2	0.8300	1.1458
2	DILUTION CONTRL	1	0.8000	1.1071
2	DILUTION CONTRL	2	0.9000	1.2490
3	0.069	1	0.9200	1.2840
3	0.069	2	0.8800	1.2171
4	0.12	1	0.7800	1.0826
4	0.12	2	0.8300	1.1458
5	0.21	1	0.8300	1.3030
5	0.21	2	0.8300	1.1458
6	0.43	1	0.7200	1.0244
6	0.43	2	0.9000	1.2490
7	0.97	1	0.9000	1.2490
7	0.97	2	0.6700	0.9589

TITLE: 417203-02, PROPICONAZOLE, SURVIVAL AT TERMINATION  
 FILE: A:41720302.DT2  
 TRANSFORM: ARC SINE(SQUARE ROOT(Y))

NUMBER OF GROUPS: 7

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	SOLVENT CONTRL	1	0.9300	1.3030
1	SOLVENT CONTRL	2	0.8500	1.1731
2	DILUTION CONTRL	1	0.9800	1.4289
2	DILUTION CONTRL	2	1.0000	1.4917
3	0.069	1	0.9800	1.4289
3	0.069	2	1.0000	1.4917
4	0.12	1	0.9800	1.3453
4	0.12	2	0.9300	1.3030
5	0.21	1	0.9800	1.4289
5	0.21	2	0.9500	1.3453
6	0.43	1	1.0000	1.4917
6	0.43	2	1.0000	1.4917
7	0.97	1	0.8300	1.1458
7	0.97	2	0.6300	0.9169

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Data Listing

File: prepicen

Date: 05-26-1992

Obs.	CONC	REP	WEIGHT	LENGTH
1	1.0000	1.0000	0.374600	33.0000
2	1.0000	1.0000	0.395900	34.0000
3	1.0000	1.0000	0.291300	31.0000
4	1.0000	1.0000	0.252300	29.0000
5	1.0000	1.0000	0.228300	28.0000
6	1.0000	1.0000	0.266700	29.0000
7	1.0000	1.0000	0.247300	30.0000
8	1.0000	1.0000	0.051100	18.0000
9	1.0000	1.0000	0.437400	33.0000
10	1.0000	1.0000	0.233600	30.0000
11	1.0000	1.0000	0.227700	28.0000
12	1.0000	1.0000	0.260000	29.0000
13	1.0000	1.0000	0.225300	28.0000
14	1.0000	1.0000	0.315800	32.0000
15	1.0000	1.0000	0.296600	31.0000
16	1.0000	1.0000	0.406100	34.0000
17	1.0000	1.0000	0.227800	29.0000
18	1.0000	1.0000	0.350200	33.0000
19	1.0000	1.0000	0.278800	32.0000
20	1.0000	1.0000	0.173500	27.0000
21	1.0000	1.0000	0.180100	28.0000
22	1.0000	1.0000	0.216000	28.0000
23	1.0000	1.0000	0.293400	32.0000
24	1.0000	1.0000	0.374600	35.0000
25	1.0000	1.0000	0.401300	33.0000
26	1.0000	1.0000	0.232200	28.0000
27	1.0000	1.0000	0.372100	33.0000
28	1.0000	1.0000	0.261300	30.0000
29	1.0000	1.0000	0.232600	28.0000
30	1.0000	1.0000	0.113800	28.0000
31	1.0000	1.0000	0.114000	28.0000
32	1.0000	1.0000	0.233600	30.0000
33	1.0000	1.0000	0.263500	27.0000
34	1.0000	1.0000	0.056700	19.0000
35	1.0000	1.0000	0.281100	30.0000
36	1.0000	1.0000	0.438200	35.0000
37	1.0000	1.0000	0.281000	31.0000
38	1.0000	2.0000	0.227100	26.0000
39	1.0000	2.0000	0.185500	26.0000
40	1.0000	2.0000	0.201100	28.0000
41	1.0000	2.0000	0.202100	27.0000
42	1.0000	2.0000	0.256400	30.0000
43	1.0000	2.0000	0.284000	33.0000
44	1.0000	2.0000	0.168400	26.0000
45	1.0000	2.0000	0.292800	32.0000
46	1.0000	2.0000	0.232800	30.0000
47	1.0000	2.0000	0.352100	28.0000
48	1.0000	2.0000	0.468900	35.0000
49	1.0000	2.0000	0.233100	29.0000
50	1.0000	2.0000	0.227600	28.0000
51	1.0000	2.0000	0.380900	28.0000
52	1.0000	2.0000	0.073900	21.0000
53	1.0000	2.0000	0.146300	26.0000
54	1.0000	2.0000	0.203100	27.0000
55	1.0000	2.0000	0.225700	29.0000

Obs.	CONC	REP	WEIGHT	LENGTH
56	1.0000	2.0000	0.243800	29.0000
57	1.0000	2.0000	0.247200	31.0000
58	1.0000	2.0000	0.201300	26.0000
59	1.0000	2.0000	0.262600	28.0000
60	1.0000	2.0000	0.258600	30.0000
61	1.0000	2.0000	0.193000	28.0000
62	1.0000	2.0000	0.205100	28.0000
63	1.0000	2.0000	0.170800	28.0000
64	1.0000	2.0000	0.259900	30.0000
65	1.0000	2.0000	0.264000	30.0000
66	1.0000	2.0000	0.278900	30.0000
67	1.0000	2.0000	0.394000	35.0000
68	1.0000	2.0000	0.367000	41.0000
69	1.0000	2.0000	0.449000	35.0000
70	1.0000	2.0000	0.308600	23.0000
71	1.0000	2.0000	0.126900	26.0000
72	2.0000	1.0000	0.337200	32.0000
73	2.0000	1.0000	0.301700	32.0000
74	2.0000	1.0000	0.318600	32.0000
75	2.0000	1.0000	0.110100	23.0000
76	2.0000	1.0000	0.189700	26.0000
77	2.0000	1.0000	0.386800	34.0000
78	2.0000	1.0000	0.190800	28.0000
79	2.0000	1.0000	0.393500	34.0000
80	2.0000	1.0000	0.478100	35.0000
81	2.0000	1.0000	0.341400	34.0000
82	2.0000	1.0000	0.357800	34.0000
83	2.0000	1.0000	0.336100	34.0000
84	2.0000	1.0000	0.367700	34.0000
85	2.0000	1.0000	0.229500	31.0000
86	2.0000	1.0000	0.358100	33.0000
87	2.0000	1.0000	0.467300	38.0000
88	2.0000	1.0000	0.389100	34.0000
89	2.0000	1.0000	0.230600	29.0000
90	2.0000	1.0000	0.373700	33.0000
91	2.0000	1.0000	0.507000	37.0000
92	2.0000	1.0000	0.326600	33.0000
93	2.0000	1.0000	0.431600	31.0000
94	2.0000	1.0000	0.398400	33.0000
95	2.0000	1.0000	0.268400	30.0000
96	2.0000	1.0000	0.422000	34.0000
97	2.0000	1.0000	0.306600	31.0000
98	2.0000	1.0000	0.478100	35.0000
99	2.0000	1.0000	0.549000	38.0000
100	2.0000	1.0000	0.385800	34.0000
101	2.0000	1.0000	0.385400	33.0000
102	2.0000	1.0000	0.181700	27.0000
103	2.0000	1.0000	0.157200	30.0000
104	2.0000	1.0000	0.193500	28.0000
105	2.0000	1.0000	0.324300	21.0000
106	2.0000	1.0000	0.331200	25.0000
107	2.0000	1.0000	0.632800	36.0000
108	2.0000	1.0000	0.329200	33.0000
109	2.0000	1.0000	0.387000	32.0000
110	2.0000	1.0000	0.454100	36.0000

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Obs.	CONC	REP	WEIGHT	LENGTH
111	2.0000	2.0000	0.319400	32.0000
112	2.0000	2.0000	0.372000	33.0000
113	2.0000	2.0000	0.507400	36.0000
114	2.0000	2.0000	0.239700	29.0000
115	2.0000	2.0000	0.479500	35.0000
116	2.0000	2.0000	0.377000	33.0000
117	2.0000	2.0000	0.244500	29.0000
118	2.0000	2.0000	0.397700	35.0000
119	2.0000	2.0000	0.433500	34.0000
120	2.0000	2.0000	0.171200	26.0000
121	2.0000	2.0000	0.397000	34.0000
122	2.0000	2.0000	0.393600	35.0000
123	2.0000	2.0000	0.355400	34.0000
124	2.0000	2.0000	0.409800	34.0000
125	2.0000	2.0000	0.417000	35.0000
126	2.0000	2.0000	0.372400	34.0000
127	2.0000	2.0000	0.522500	36.0000
128	2.0000	2.0000	0.465700	34.0000
129	2.0000	2.0000	0.408500	32.0000
130	2.0000	2.0000	0.337000	33.0000
131	2.0000	2.0000	0.252100	29.0000
132	2.0000	2.0000	0.443300	35.0000
133	2.0000	2.0000	0.324400	32.0000
134	2.0000	2.0000	0.323300	32.0000
135	2.0000	2.0000	0.191200	29.0000
136	2.0000	2.0000	0.451300	38.0000
137	2.0000	2.0000	0.356400	34.0000
138	2.0000	2.0000	0.440100	35.0000
139	2.0000	2.0000	0.362400	36.0000
140	2.0000	2.0000	0.345900	34.0000
141	2.0000	2.0000	0.397000	35.0000
142	2.0000	2.0000	0.519400	38.0000
143	2.0000	2.0000	0.464500	36.0000
144	2.0000	2.0000	0.175400	26.0000
145	2.0000	2.0000	0.529400	36.0000
146	2.0000	2.0000	0.355900	34.0000
147	2.0000	2.0000	0.253600	31.0000
148	2.0000	2.0000	0.487900	37.0000
149	2.0000	2.0000	0.485900	36.0000
150	2.0000	2.0000	0.403700	34.0000
151	3.0000	1.0000	0.418500	35.0000
152	3.0000	1.0000	0.398100	34.0000
153	3.0000	1.0000	0.298400	34.0000
154	3.0000	1.0000	0.396900	34.0000
155	3.0000	1.0000	0.243500	31.0000
156	3.0000	1.0000	0.277600	31.0000
157	3.0000	1.0000	0.258600	34.0000
158	3.0000	1.0000	0.257700	30.0000
159	3.0000	1.0000	0.326700	33.0000
160	3.0000	1.0000	0.347500	23.0000
161	3.0000	1.0000	0.353200	33.0000
162	3.0000	1.0000	0.405000	34.0000
163	3.0000	1.0000	0.350800	34.0000
164	3.0000	1.0000	0.379500	35.0000
165	3.0000	1.0000	0.312400	33.0000
166	3.0000	1.0000	0.357200	34.0000
167	3.0000	1.0000	0.464200	36.0000
168	3.0000	1.0000	0.342100	34.0000
169	3.0000	1.0000	0.256900	30.0000
170	3.0000	1.0000	0.341400	33.0000
171	3.0000	1.0000	0.274100	31.0000
172	3.0000	1.0000	0.117900	23.0000
173	3.0000	1.0000	0.230100	28.0000
174	3.0000	1.0000	0.349600	33.0000
175	3.0000	1.0000	0.435100	35.0000
176	3.0000	1.0000	0.310400	31.0000
177	3.0000	1.0000	0.394700	35.0000
178	3.0000	1.0000	0.316000	33.0000
179	3.0000	1.0000	0.429100	34.0000
180	3.0000	1.0000	0.273100	31.0000
181	3.0000	1.0000	0.297100	32.0000
182	3.0000	1.0000	0.235700	30.0000
183	3.0000	1.0000	0.398300	34.0000
184	3.0000	1.0000	0.412100	33.0000
185	3.0000	1.0000	0.313300	32.0000
186	3.0000	1.0000	0.354800	33.0000
187	3.0000	1.0000	0.340200	34.0000
188	3.0000	1.0000	0.369500	34.0000
189	3.0000	1.0000	0.239000	31.0000
190	3.0000	2.0000	0.271800	30.0000
191	3.0000	2.0000	0.562100	38.0000
192	3.0000	2.0000	0.315300	33.0000
193	3.0000	2.0000	0.275700	31.0000
194	3.0000	2.0000	0.287300	31.0000
195	3.0000	2.0000	0.129100	24.0000
196	3.0000	2.0000	0.375900	34.0000
197	3.0000	2.0000	0.289900	31.0000
198	3.0000	2.0000	0.525200	35.0000
199	3.0000	2.0000	0.318500	33.0000
200	3.0000	2.0000	0.470300	36.0000
201	3.0000	2.0000	0.390000	35.0000
202	3.0000	2.0000	0.343500	34.0000
203	3.0000	2.0000	0.371500	33.0000
204	3.0000	2.0000	0.452400	35.0000
205	3.0000	2.0000	0.431400	35.0000
206	3.0000	2.0000	0.419900	35.0000
207	3.0000	2.0000	0.288200	32.0000
208	3.0000	2.0000	0.455300	37.0000
209	3.0000	2.0000	0.470800	35.0000
210	3.0000	2.0000	0.242600	28.0000
211	3.0000	2.0000	0.282600	32.0000
212	3.0000	2.0000	0.451500	37.0000
213	3.0000	2.0000	0.406100	34.0000
214	3.0000	2.0000	0.348900	31.0000
215	3.0000	2.0000	0.373700	32.0000
216	3.0000	2.0000	0.498500	38.0000
217	3.0000	2.0000	0.422500	35.0000
218	3.0000	2.0000	0.244800	30.0000
219	3.0000	2.0000	0.318900	24.0000
220	3.0000	2.0000	0.305000	32.0000

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Obs.	CONC	REP	WEIGHT	LENGTH
221	3.0000	2.0000	0.316600	34.0000
222	3.0000	2.0000	0.365300	33.0000
223	3.0000	2.0000	0.482200	37.0000
224	3.0000	2.0000	0.273900	31.0000
225	3.0000	2.0000	0.307800	33.0000
226	3.0000	2.0000	0.451400	33.0000
227	3.0000	2.0000	0.258500	31.0000
228	3.0000	2.0000	0.394600	36.0000
229	3.0000	2.0000	0.348800	32.0000
230	4.0000	1.0000	0.350600	33.0000
231	4.0000	1.0000	0.244500	28.0000
232	4.0000	1.0000	0.352900	33.0000
233	4.0000	1.0000	0.245600	30.0000
234	4.0000	1.0000	0.367500	34.0000
235	4.0000	1.0000	0.287000	29.0000
236	4.0000	1.0000	0.441000	37.0000
237	4.0000	1.0000	0.396500	31.0000
238	4.0000	1.0000	0.362200	34.0000
239	4.0000	1.0000	0.278500	32.0000
240	4.0000	1.0000	0.238000	30.0000
241	4.0000	1.0000	0.305100	29.0000
242	4.0000	1.0000	0.473200	36.0000
243	4.0000	1.0000	0.327900	31.0000
244	4.0000	1.0000	0.223900	30.0000
245	4.0000	1.0000	0.484200	36.0000
246	4.0000	1.0000	0.366800	35.0000
247	4.0000	1.0000	0.371600	34.0000
248	4.0000	1.0000	0.258900	31.0000
249	4.0000	1.0000	0.366400	33.0000
250	4.0000	1.0000	0.337600	32.0000
251	4.0000	1.0000	0.273400	28.0000
252	4.0000	1.0000	0.373000	34.0000
253	4.0000	1.0000	0.461700	36.0000
254	4.0000	1.0000	0.370100	34.0000
255	4.0000	1.0000	0.355100	29.0000
256	4.0000	1.0000	0.205100	29.0000
257	4.0000	1.0000	0.296000	31.0000
258	4.0000	1.0000	0.368100	33.0000
259	4.0000	1.0000	0.272600	31.0000
260	4.0000	1.0000	0.478600	34.0000
261	4.0000	1.0000	0.269800	31.0000
262	4.0000	1.0000	0.356200	33.0000
263	4.0000	1.0000	0.250100	30.0000
264	4.0000	1.0000	0.434600	35.0000
265	4.0000	1.0000	0.301800	31.0000
266	4.0000	1.0000	0.207100	29.0000
267	4.0000	1.0000	0.332700	31.0000
268	4.0000	2.0000	0.342600	33.0000
269	4.0000	2.0000	0.313500	31.0000
270	4.0000	2.0000	0.296800	32.0000
271	4.0000	2.0000	0.279000	31.0000
272	4.0000	2.0000	0.370000	33.0000
273	4.0000	2.0000	0.414800	34.0000
274	4.0000	2.0000	0.370500	34.0000
275	4.0000	2.0000	0.261000	30.0000
276	4.0000	2.0000	0.385700	27.0000
277	4.0000	2.0000	0.375000	34.0000
278	4.0000	2.0000	0.356000	32.0000
279	4.0000	2.0000	0.380200	30.0000
280	4.0000	2.0000	0.444900	36.0000
281	4.0000	2.0000	0.431900	25.0000
282	4.0000	2.0000	0.326400	33.0000
283	4.0000	2.0000	0.379100	34.0000
284	4.0000	2.0000	0.442300	33.0000
285	4.0000	2.0000	0.374100	32.0000
286	4.0000	2.0000	0.241800	31.0000
287	4.0000	2.0000	0.213000	29.0000
288	4.0000	2.0000	0.428800	35.0000
289	4.0000	2.0000	0.449400	36.0000
290	4.0000	2.0000	0.374500	33.0000
291	4.0000	2.0000	0.360100	33.0000
292	4.0000	2.0000	0.287000	31.0000
293	4.0000	2.0000	0.242900	31.0000
294	4.0000	2.0000	0.344600	32.0000
295	4.0000	2.0000	0.353100	33.0000
296	4.0000	2.0000	0.368200	33.0000
297	4.0000	2.0000	0.392500	34.0000
298	4.0000	2.0000	0.388200	34.0000
299	4.0000	2.0000	0.361700	33.0000
300	4.0000	2.0000	0.382100	34.0000
301	4.0000	2.0000	0.325600	31.0000
302	4.0000	2.0000	0.294100	31.0000
303	4.0000	2.0000	0.309900	35.0000
304	4.0000	2.0000	0.298800	30.0000
305	5.0000	1.0000	0.241400	29.0000
306	5.0000	1.0000	0.337700	32.0000
307	5.0000	1.0000	0.253000	30.0000
308	5.0000	1.0000	0.142900	26.0000
309	5.0000	1.0000	0.3274100	31.0000
310	5.0000	1.0000	0.284200	31.0000
311	5.0000	1.0000	0.301800	31.0000
312	5.0000	1.0000	0.308100	31.0000
313	5.0000	1.0000	0.323800	31.0000
314	5.0000	1.0000	0.350100	33.0000
315	5.0000	1.0000	0.299500	31.0000
316	5.0000	1.0000	0.321300	33.0000
317	5.0000	1.0000	0.311100	24.0000
318	5.0000	1.0000	0.352900	32.0000
319	5.0000	1.0000	0.240900	30.0000
320	5.0000	1.0000	0.253800	30.0000
321	5.0000	1.0000	0.219100	32.0000
322	5.0000	1.0000	0.334400	27.0000
323	5.0000	1.0000	0.355900	32.0000
324	5.0000	1.0000	0.377400	32.0000
325	5.0000	1.0000	0.296300	31.0000
326	5.0000	1.0000	0.223900	28.0000
327	5.0000	1.0000	0.255800	30.0000
328	5.0000	1.0000	0.367900	34.0000
329	5.0000	1.0000	0.385300	35.0000
330	5.0000	1.0000	0.278300	31.0000

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Obs.	CONC	REP	WEIGHT	LENGTH
331	5.0000	1.0000	0.300500	31.0000
332	5.0000	1.0000	0.348000	34.0000
333	5.0000	1.0000	0.312600	32.0000
334	5.0000	1.0000	0.438300	36.0000
335	5.0000	1.0000	0.307000	32.0000
336	5.0000	1.0000	0.211600	30.0000
337	5.0000	1.0000	0.269900	31.0000
338	5.0000	1.0000	0.317300	33.0000
339	5.0000	1.0000	0.231400	28.0000
340	5.0000	1.0000	0.334300	33.0000
341	5.0000	1.0000	0.236000	29.0000
342	5.0000	1.0000	0.422000	34.0000
343	5.0000	1.0000	0.267600	32.0000
344	5.0000	2.0000	0.210500	29.0000
345	5.0000	2.0000	0.430500	35.0000
346	5.0000	2.0000	0.369400	32.0000
347	5.0000	2.0000	0.398100	35.0000
348	5.0000	2.0000	0.289800	31.0000
349	5.0000	2.0000	0.253100	29.0000
350	5.0000	2.0000	0.210800	29.0000
351	5.0000	2.0000	0.348000	32.0000
352	5.0000	2.0000	0.369000	33.0000
353	5.0000	2.0000	0.228300	28.0000
354	5.0000	2.0000	0.400600	34.0000
355	5.0000	2.0000	0.275800	30.0000
356	5.0000	2.0000	0.256100	31.0000
357	5.0000	2.0000	0.264500	29.0000
358	5.0000	2.0000	0.282700	33.0000
359	5.0000	2.0000	0.395400	34.0000
360	5.0000	2.0000	0.379900	34.0000
361	5.0000	2.0000	0.351100	32.0000
362	5.0000	2.0000	0.424500	35.0000
363	5.0000	2.0000	0.272200	31.0000
364	5.0000	2.0000	0.393900	34.0000
365	5.0000	2.0000	0.287300	30.0000
366	5.0000	2.0000	0.247800	31.0000
367	5.0000	2.0000	0.370400	33.0000
368	5.0000	2.0000	0.243700	30.0000
369	5.0000	2.0000	0.384300	35.0000
370	5.0000	2.0000	0.380100	34.0000
371	5.0000	2.0000	0.306500	32.0000
372	5.0000	2.0000	0.246800	30.0000
373	5.0000	2.0000	0.204100	28.0000
374	5.0000	2.0000	0.222400	27.0000
375	5.0000	2.0000	0.301400	32.0000
376	5.0000	2.0000	0.286600	31.0000
377	5.0000	2.0000	0.158800	25.0000
378	5.0000	2.0000	0.287100	30.0000
379	5.0000	2.0000	0.314000	31.0000
380	5.0000	2.0000	0.361400	33.0000
381	5.0000	2.0000	0.101900	21.0000
382	5.0000	1.0000	0.458900	35.0000
383	5.0000	1.0000	0.387800	31.0000
384	5.0000	1.0000	0.241400	29.0000
385	5.0000	1.0000	0.206300	27.0000
386	5.0000	1.0000	0.221300	28.0000
387	5.0000	1.0000	0.245300	32.0000
388	5.0000	1.0000	0.273000	30.0000
389	5.0000	1.0000	0.267900	31.0000
390	5.0000	1.0000	0.440500	31.0000
391	5.0000	1.0000	0.284800	30.0000
392	5.0000	1.0000	0.240300	27.0000
393	5.0000	1.0000	0.221900	26.0000
394	5.0000	1.0000	0.344100	31.0000
395	5.0000	1.0000	0.233100	29.0000
396	5.0000	1.0000	0.112200	22.0000
397	5.0000	1.0000	0.240800	31.0000
398	5.0000	1.0000	0.413700	35.0000
399	5.0000	1.0000	0.381300	33.0000
400	5.0000	1.0000	0.168100	26.0000
401	5.0000	1.0000	0.277400	30.0000
402	5.0000	1.0000	0.216100	30.0000
403	5.0000	1.0000	0.311300	31.0000
404	5.0000	1.0000	0.362600	31.0000
405	5.0000	1.0000	0.311000	31.0000
406	5.0000	1.0000	0.107400	23.0000
407	5.0000	1.0000	0.289000	29.0000
408	5.0000	1.0000	0.305100	30.0000
409	5.0000	1.0000	0.386100	33.0000
410	5.0000	1.0000	0.292000	31.0000
411	5.0000	1.0000	0.307900	30.0000
412	5.0000	1.0000	0.234700	29.0000
413	5.0000	1.0000	0.305300	30.0000
414	5.0000	1.0000	0.352500	32.0000
415	5.0000	1.0000	0.349300	33.0000
416	5.0000	1.0000	0.383100	32.0000
417	5.0000	1.0000	0.311500	31.0000
418	5.0000	1.0000	0.271100	30.0000
419	5.0000	1.0000	0.263100	30.0000
420	5.0000	1.0000	0.481700	34.0000
421	5.0000	1.0000	0.204500	28.0000
422	5.0000	2.0000	0.171400	28.0000
423	5.0000	2.0000	0.186600	26.0000
424	5.0000	2.0000	0.183000	27.0000
425	5.0000	2.0000	0.314800	31.0000
426	5.0000	2.0000	0.282000	31.0000
427	5.0000	2.0000	0.213000	27.0000
428	5.0000	2.0000	0.365800	32.0000
429	5.0000	2.0000	0.336200	31.0000
430	5.0000	2.0000	0.318200	33.0000
431	5.0000	2.0000	0.361700	33.0000
432	5.0000	2.0000	0.301900	28.0000
433	5.0000	2.0000	0.224600	28.0000
434	5.0000	2.0000	0.233300	29.0000
435	5.0000	2.0000	0.388900	22.0000
436	5.0000	2.0000	0.355200	17.0000
437	5.0000	2.0000	0.368200	30.0000
438	5.0000	2.0000	0.284200	28.0000
439	5.0000	2.0000	0.186000	28.0000
440	5.0000	2.0000	0.276100	30.0000

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Obs.	CONC	REP	WEIGHT	LENGTH
441	6.0000	2.0000	0.315300	31.0000
442	6.0000	2.0000	0.182200	28.0000
443	6.0000	2.0000	0.210100	28.0000
444	6.0000	2.0000	0.327600	32.0000
445	6.0000	2.0000	0.273900	30.0000
446	6.0000	2.0000	0.193500	28.0000
447	6.0000	2.0000	0.347400	33.0000
448	6.0000	2.0000	0.255100	29.0000
449	6.0000	2.0000	0.184300	27.0000
450	6.0000	2.0000	0.213800	30.0000
451	6.0000	2.0000	0.277200	30.0000
452	6.0000	2.0000	0.281600	29.0000
453	6.0000	2.0000	0.297900	30.0000
454	6.0000	2.0000	0.203900	28.0000
455	6.0000	2.0000	0.328400	31.0000
456	6.0000	2.0000	0.197300	22.0000
457	6.0000	2.0000	0.300200	31.0000
458	6.0000	2.0000	0.194500	28.0000
459	6.0000	2.0000	0.276300	30.0000
460	6.0000	2.0000	0.210800	27.0000
461	6.0000	2.0000	0.181500	26.0000
462	7.0000	1.0000	0.040200	15.0000
463	7.0000	1.0000	0.178900	28.0000
464	7.0000	1.0000	0.066700	22.0000
465	7.0000	1.0000	0.119400	23.0000
466	7.0000	1.0000	0.139400	25.0000
467	7.0000	1.0000	0.167500	28.0000
468	7.0000	1.0000	0.169100	27.0000
469	7.0000	1.0000	0.087500	23.0000
470	7.0000	1.0000	0.250000	30.0000
471	7.0000	1.0000	0.040000	17.0000
472	7.0000	1.0000	0.026700	15.0000
473	7.0000	1.0000	0.121800	23.0000
474	7.0000	1.0000	0.122200	22.0000
475	7.0000	1.0000	0.164600	26.0000
476	7.0000	1.0000	0.093800	17.0000
477	7.0000	1.0000	0.116800	25.0000
478	7.0000	1.0000	0.049100	18.0000
479	7.0000	1.0000	0.044800	18.0000
480	7.0000	1.0000	0.095900	22.0000
481	7.0000	1.0000	0.038600	15.0000
482	7.0000	1.0000	0.121100	25.0000
483	7.0000	1.0000	0.113400	24.0000
484	7.0000	1.0000	0.041700	15.0000
485	7.0000	1.0000	0.063500	21.0000
486	7.0000	1.0000	0.105100	23.0000
487	7.0000	1.0000	0.121300	24.0000
488	7.0000	1.0000	0.043500	18.0000
489	7.0000	1.0000	0.032100	16.0000
490	7.0000	1.0000	0.151000	27.0000
491	7.0000	1.0000	0.074900	20.0000
492	7.0000	1.0000	0.112200	21.0000
493	7.0000	1.0000	0.025900	15.0000
494	7.0000	1.0000	0.098100	22.0000
495	7.0000	2.0000	0.080400	12.0000
Obs.	CONC	REP	WEIGHT	LENGTH
496	7.0000	2.0000	0.083500	21.0000
497	7.0000	2.0000	0.067700	19.0000
498	7.0000	2.0000	0.042000	11.0000
499	7.0000	2.0000	0.034600	16.0000
500	7.0000	2.0000	0.049600	17.0000
501	7.0000	2.0000	0.082000	21.0000
502	7.0000	2.0000	0.051200	16.0000
503	7.0000	2.0000	0.058000	17.0000
504	7.0000	2.0000	0.040400	17.0000
505	7.0000	2.0000	0.079000	16.0000
506	7.0000	2.0000	0.066100	17.0000
507	7.0000	2.0000	0.040000	14.0000
508	7.0000	2.0000	0.077400	21.0000
509	7.0000	2.0000	0.049900	16.0000
510	7.0000	2.0000	0.097400	21.0000
511	7.0000	2.0000	0.043800	15.0000
512	7.0000	2.0000	0.141000	24.0000
513	7.0000	2.0000	0.037900	16.0000
514	7.0000	2.0000	0.077300	19.0000
515	7.0000	2.0000	0.031100	15.0000
516	7.0000	2.0000	0.060500	19.0000
517	7.0000	2.0000	0.043000	17.0000
518	7.0000	2.0000	0.063600	18.0000
519	7.0000	2.0000	0.084400	21.0000

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