Appendix VII

EXAMPLE INPUT AND OUTPUT FROM DISTANCE

This appendix includes an example analysis for the June 1993 survey of the Centennial Pronghorn Herd in southeastern Wyoming. It demonstrates some of the different models implemented in DISTANCE and some aspects of model selection. To save paper, four pages of the analysis have been reduced to fit each page in the appendix. The input specifies an analysis of grouped data for a clustered population. By default, DISTANCE tested for cluster size bias. Distance band cut-points were adjusted for the actual mean survey height of 343 feet AGL. This analysis requested estimates using five models (key + adjustment terms):

- Uniform + Cosine/Sequential: DISTANCE attempts to fit consecutively higher models (e.g., one with 1 cosine term, then one with 2 cosine terms, then one with 3 cosine terms, etc.) until there is no further improvement in the estimate. DISTANCE selected a model with 1 cosine term. Note that the detection curve does not fit the A band very well. It underestimates the population size.
- Uniform + 3 Cosine Terms: This estimate forced DISTANCE to use 3 cosine terms. Note that the detection curve is more flexible and fits the histogram of observed distances better. However, the Goodness-of-Fit test cannot be performed because there aren't enough degrees of freedom. The standard errors for this model are much larger than those for Model 1. This illustrates the "penalty" of fitting more terms to the model.
- Half-normal + Cosine/Sequential: DISTANCE selected a model with 1 cosine term. The model fits the histogram better than Model 1 although it does not reach the top of the A band. Model 3 is simpler than Model 2 but the estimate is not substantially different. It is better than the previous 2 models.
- Negative Exponential: This simple model fits the histogram pretty well.
 However, it does not have a shoulder near the line so it is not robust. In this analysis, it fits better than the previous models. It had the lowest (i.e., "best") AIC.
- 5. <u>Hazard + Cosine/Sequential</u>: DISTANCE fit a 2 parameter model. The hazard model forces a shoulder near the line on the detection probability function. This model fits the histogram pretty well, particularly the A band. The estimate is about as good as Model 4. It has the second lowest AIC of the 5 models and would also be acceptable. However, Model 5 is the least precise of the models.

Cluster size bias was not significant in this analysis.

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Page 19
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Centennial Franchism Hard - June 28-31, 1173
                                                                                                                                                                                                                                                                                                    $1/28/57 14:55
Feet 8
Program DISTANCE - Analysis of Distance Sampling Data V2.2
Contental Programs Herd - June 28-21, 1993
                                                                                                                                                                                                                                                                                                                                                                                                                 Stratum: Centenniel Frenchern Herd - Occupied Habitat
Area: 1122-2000
     Stratum: Centennial Franchons Mard - Dunayied Habitat
Area: 1159.8888
                                                                                                                                                                                                                                                                                                                                                                                                                 Easyle: Line 19 (U185 47.49-5)

Effect: 25.1800 8 of sheer-atlants 24.

Observation 8 Distance Cluster title
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      Tample: Line IR (Midth be no No)
Effect: Ff.4000 R of charrestons
Observation R Bistance Cluster
                                                                                       43.108
106.88
13.408
45.008
107.58
40.388
141.08
12.588
75.588
76.588
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Fee: 12
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 Program DITAMEE - Analysis of Distance Easyling Data FE. 2 #2/26/97 14:55
Contennial Promptern Hord - June 28-21, 1992 Fee 9
                                                                                                                                                                                                                                                                                                                                                                                                              Program BISINGS - Analysis of Distance Sampling Hote V2.3
Contennial Franchers Hord - June 20-21, 1993
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     61/38/47 14:55
Feve 11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Estimation Options
Listing
     Stratue: Centennial Pringbarn Herd - Occupied Mabitat
Aces: 1953-800H
     Sample: Line 15 (MISS 58.00-m)
Effect: 27.4000 W of characters: 30
Observation W Distance Cluster size
                                                                                                                                                                                                                                                                                                                                                                                                                    Paraseter Estimation Specification
                                                                                                                                                                                                                                                                                                                                                                                                                    Enjourter rate for all data combined
Estection probability for all data combined
Espected cluster size for all data combined
Energy for all data combined
                                                                                       86 888
45:608
154:58
42:488
162:58
86:588
13:008
83:608
14:188
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                                                                                                                                                                                                                                                                                                                                                                                                                    manipule based on distance intervals width apenified as: 228:8000
                                                                                                                                                                                                                                                                                                                                                                                                                    Analysis based on event sizes
Experied value of cluster size computed by : regression of legistiff on eletiff
                                                                                                                                                                                                                                                                                                                                                                                                                   Extinators:
                                                                                                                                                                                                                                                                                                                                                                                                                 Estimator I
Kas: Whifarm, h(y) = 1/0

Albustments - Thorston - Cosines

- Torm selection made - Inquestial

- Torm selection spiterion: Liveliheed ratio test
       Sample: Line 39 (H385 47.88-1)
Effort: 25,3000 # of abservations!
Observation # Distance Cluster
                                                                                                                                                                                                                                                                                                                                                                                                                   Estimates 2

Algorithms, 2(y) T L/S

Algorithms - Function | Genimes - mumber of terms: 1

Estimator 2

Reys Andrewal, N(y) = Eapl-y-w2/(Dance) model

Algorithms - Function | Genimes |

Town assisting model | Genimes |

Town assisting model | Genimes |

Town assisting criterion: Likelihood ratio less

Estimator |

E
                                                                                          78.868
186.66
42.506
12.506
12.606
13.006
15.756
16.756
42.688
42.688
42.688
171.68
183.56
46.686
167.88
                                                                                                                                                                                                                                                                                                                                                                                                                    Estimator 4
Key: Negative Exponential, K(y) = Exp(*y/ACI7)
Adjustments - Function
- Term selection mode - Sequential
- Term selection mode - Sequential
- Term selection optionism: Likelihood matis test
                                                                                                                                                                                                                                                                                                                                                                                                                 - Term selection erostical form of the following of the selection and a Sequential Term selection criterion | Libelihood ratio test
                                                                                                                                                                                                                                                                                                                                                                                                                   Extinator refertion: Name, display a); estimates
Extination fontions: constrained to be dearly monatons convincements
```

see Made: I selected over model I based on Libelihead ratio test

Pees 12

Variance of n: Empirical extinate from namele Variance of 6000: HLE extinate

Geadness of Cit.

Based on grouped distance data intervals

Steamer of Seres

Date items

Data lines:

n - number of abserved shjects (single or squature of animals)

L - total length of transact line(s)

k - number of tamples

K - pend transact effert, tepically Eck

T - length of tree searched in our counting

EC - excuster rate in/L or n/K or n/T)

H - nidth of line transact or radius of pend tyansact

n(i) distance is rith shearwatten

t(i) distance is rith shearwatten

t(i) distance is rith shearwatten

t(i) distance is not represent the counting of the cou

Parameters of functions of persectors

m. — number of responsives in the model

ALII - 1-th parameter in the model

ALII - 1-th parameter in the model

ALII - 1-th parameter in the stituted probability designs (unclaimedef)

First - 1-th parameter of affective designs for line transmits

(G) - 2-FIZ.

(G) - 3-FIZ.

(G) - 3

Fegs 14

F1341-6-341412-234527_93-007

Propose CINIMEE - Analysis of Eistenic Lampling Sets 92.2 Centennial Franchisco Mard - June 28-21, 1993 #1/28/37 14:55 Feet 38

* Probability Fanction Entimation *
* Rode: Aslanting *

Effort 334 eeee H sacelts 14 228 eeee H shortestions 205

Hate: The number of adjustment parameters allowed has been reduced to -3 because of limited number of intervals.

Hodel 3

Delement we kind = 1/4

Fermits:
Convergence was Albieved with 1 function evaluations - Final Lofilize library value 1 - 414 - 56281

Final parameter values:

Final parameter values:

Likelihood ratio test between models 1 and 2 Likelihood ratio test value = 48.4485 Probability of a greater value = .000808 Whn Hodel 2 selected over model 1 based on likelihood ratio test

Padel 3
Unifare key, ktyl = 1/4
Coxies adjustments of orderts) | 1, 2
Excuts:
Encycygron was achieved with a function evaluations.
Finel Infilm (inhead) value = -287,26857
Ahashe information critarion = 782,37786
Final garanters values: 538635 | 133668
Hots! Parameters are helm tenstrained to obtain monatomisty.

Likelihood ratio test between models 2 and 3 Likelihood ratio test value 2 1.3655 Probability of a greater value 2 126887

PAINT ASSESSE ESSERT, \$2,497

February Co.

Program SISTAMCE - Analysis of Distance Tampline Data 92.8 Contamonal Program Hard - June 28-21, 1972

81/39/97 14:55 Pere 13

- Frenchilly Function Estimation - Parameter Estimates -

E/for: 334.0000 * temples : 14 Width 328.0000 * chappetions :395

Madel Uniform boy, big) 2 L/M Cosine adjustments of order(s) = 1

Parameter	Estimate	Errar	of Variation	Confidence Confidence	
6(4)	. 6912 . 782370-62	.4455E-91 34716E-93	13.99 5.45	-4345HE-93	. 779625-62

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9323 +H

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7 age 17

225.000

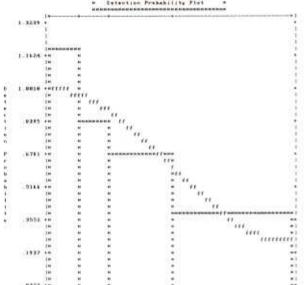
Feet 18.

File: +174(412-274527_13.09T

Page 19 W1/30/97 14:55 Paye 16

Program DISIAMEE - Analysis of Distance Sampling Data W2.2 Cantennial Presphera Hard - June 28-21, 1992 #1/38/37 14:55 7441 14

- Probabilita Function Estimation - Establish Probability Flat -



114.400 Perpendicular distance in PETERS

File o Minte EVASEP 49 00T

17.286

Program SISTANCE - Analysis of Distance Sampling Sata 98.2 Contained Program Hard - June 29-21, 1993 61/36/37 14:55 Feys 13

Probability Function Estimation = Final Square Graduats of Fit Test =

tiet)		:41 11071	Ubserved Talues	Espected Talues	Dur-square Faires
1	- 000	29 - 6	61.0	54.76	2.631
20	20.6	57.2	41.0	53.54	577
3	57.2	334	25.0	FT: 44	815
4	114.	224	11.6	17.22	. 631
Letal.	Chi-summe	velue =	4.0576 De	seems of fr	retin = I

Probability of a greater Chi-square value : :12148

The propram has limited impakifity for posling. The user should judge the decemberty for posling and if necessary, do posling by hand-

Fregram DISTANCE - Analysis of Sistance Empling Data V2.2 Contemplal Frenchers Hard - June 28-21, 1992

Effect # camples width # chestral(ens) 234, 9849 14 229, 1899 285

Pedel
Uniform boy, h(y) = 3/4
Control adjustments of order(s): 1, 3, 3
Events:
Convergence and achieved with 14 function evaluations.
Final Lettinglihead value: -280,74325
Ababb intermation enterior = 793,32500
Final parameter called 447803 -413280 3270000
Note Parameters are being constrained to whisis constraintly.

FILE - NAME STATES AND

faar de

Program Silvance - Analysis of Distance Sampling Data 92.2 Cantennial Franquer Hood - June 20-21, 1993 #1/28/97 14:35 Faye 17

* Probability Function Extination *
* Parameter Extinates *

Elfart * tamples Width * sharrestions 334.8966 228 F800 285

Medel Uniform key, kCyl = L/N Cosing adjustments of order(s) | 1, 2, 3

Parameter	Point Estimate	Standard Error	Persons Coef. of Variation	93 Park Contidence	
46.11	. 6628	.2193	32.42		
AL 21	1331C-H1	6114	4944 41		
AT 31	2279	-3964	341.79		
1181	92277E-92	-15453K-BE	13.12	627136-62	19775E-91

Impling Correlation of Estimated Parameters

AC 17 AC 23 AC 23 AC 17 1-860 --763 --728 AC 27 --783 1-860 --770 AC 21 --726 --770 1.860

File: E. Wintz. 2 4527, 92.00T

Fage 71

File: 1: Wint2 #3527_13.007

Face 23 #1/28/37 14:55 Face 28

Program IISTAMCE - Analysis of Distance Lampling Data V2.2 #1/38/72 14:55
Contamnual Programmen Herd - June 28-21, 1993 Page 18

- Probability Function Estimation - Detection For Section First Commission Co

File: c: Name 258827, 98.00T

20.588

Page 22

Pregram DISTANCE - Analysis of Distance Employ Data \$2.2 01/28/27 14:55 Limitannia: Prespons Hard - Jane 20-21, 1973 Page 17

Perpendicular distance in PETERL

- Pribability Function Estimation - Chi-tquery Oceaness of Fit Test -

Call		ut ints	Personal Personal	Values	Values
1	.004	20.4	67.0	64.75	.278
2	26 6	57.2	41.0	58.41	.588
× .	57.2	114	79.6	77.04	. 617
4	214	229.	49.4	88.75	. 996

to Tearner of Freedom for the text. He text persible.

Freezen SIZIAMCE - Analysis of Sistance Lampling Data V2.2 Cantennial Freegham Hard - June 28-21, 1993

- Probability Function Estimation of Mudal Selection/Fifting -

Effect : 234 9000 * capples : 14 Width : 220.0000 * charretime : 293

Note: The supper of adjustment parameters allowed has been reduced to 2 because of limited number of intervals.

Madel 1
Maif-narmel May, big) a Egyt-quel/(SMACL)ens);
Security
Consequence was achieved miny 6 function avalantions.
Final batishes/boost rejuce 5 - 239, 42444.
Abajes information unitarion v. 782, 85136
Final parameter values 528, 428561

Hedal 2

Riff-morel hep. html 0 Expl-year/(BmA(1)mm2))

Seems eductioned of order(s) 2

Secults:

Convergence set Adhieved with 14 function evaluations:
Final Enlish(Pered) value 7 - 181, 47311

Adains information optimized in 304, 13028

Sinal parameter values 120,885827 144243

Libelihood ratio test between endels 1 and 2 Libelihood catic test value = 2.7151 Probability of a greater ratue = 0.99154 ene makel 2 salested size ands 1 hazed on libelihood ratio test

Finds 1 I

Sail-marmal hav: high of Enginemat/(Inh(IlmeII))

Savine adjustments of order(s) : 2, 3

Francis:

Energy-sav was aphenoid with II Function evaluations:
Sould not achieve rescented presisting of estimates.
Final Letibelihead value 0 - 388-74121

Nauto information epiterian 2 - 782.14248
Final separator salues: 134-450929 - 837721 183883

Note: Funcacions are being constrained to obtain sunnionintly.

Libelihead ratio test between models 2 and 3

Libelihead ratio test older = 1878

False & Micros DWHF, 21 OFF

Faur. 24

Probability of a greater value : 520283

Page 27

Program DISTANCE - Analysis of Distance Empline Data #2.5 Contennial Programs Hard - June 28-21, 1993 81/28/97 14:55 Feet 21

Probability Function Estimation = Parameter Estimates =

Effort * samples Hedth * observations 234.0000 34 220 1000 265

sel Haif-neemal hep, btg) : Expt-perZYCZeAtileeZ}} Cusing majusteents of brist(s) : 2

Persont Conf. 15 Partest Confidence Interval Print Estimate Farancier 121.9 1962 PROSE-RD 12.34 .1017 .74510E-03 1.53 12.86 1.36

Sampling Correlation of Estimated Parameters

A(1) A(2) A(3) 1 889 444 A1 21 444 1 889

4539

39.21

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-

57.200

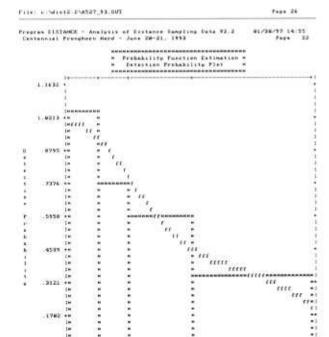
Program SISTANCE - Analysis of Distance Sampling Data VZ.S. Contential Proophers Nord - June 28-21, 1993 93/98/97 14:55 Page 23

- Pychability Function Estimation = - Onl-Texara Gredness of Fit Test =

C+11		ar.	Talues	Espected Values	Values	
	. 200	24.4	65.8	43.68	- 945	
2	28.4	37.2	48.9	35.38	993	
	37-2	214.	79.0	76.03	961	
4	114.	188	45.0	49.33	904	

Intel Chi-equare value + 1-4891 Degrees of Freeder -Probability of a greater chi-square value + .2236

The program has limited capability for posling. The user should judge the necessity for posling and if necessary, do conting by hand



Percenticular distance in MESSES

226.646

FILE COLLEGE PASSES SE OUT

Faur 28 01/28/97 14:55 Feys 34

Program ECTIANCE - Analysis of Distance Empling Data V2.2 Contents; Programmer Hers - Jane 28-31, 1993

Probability function Sitimation = Model Selection-Fatting =

Effect * templet Hidth * observations 334, 8899 228 8000 245

mute: The number of adjustment parameters allowed has been reduced to . I because of limited number of intervals.

Megation Expensation bay, Might - Expt-p/ACID gatire Dyanestial bry, 2(p) = Exp(-p/451)) Erectra Concernment was abbieved with 12 function evaluations: Could not applieve projected profitions of extinates final Leftibalished 1 salue = -206.59435 Asabe information criterion = 779.38234 final parameter values: 142.185939

Nodel 2

Megatine E-penential kep, M(y) = Exp(-y/A(1))

Deprie Adjustments of Schiercal 1

Berdelta:

Convergence max achieved with 4 function evaluations:

Final LC(1)kell/head? value + -218.54378

Abaiks information offerion = 701.38748

Final parameter values: 142.181818 - 886552

Librisheed ratio test between models 1 and 2 Librisheed ratio test value 2 .0045 Probability of a greater ratios 2 .354157 model 1 asiasted aver mode) 2 based on librisheed ratio test

Intel Chi-equare value :

Program DISIANCE - Analysis of Distance Sampling Data V2.2 Centennial Propphore Hard - June 28-22, 1993

* Frehability Function Estimation *

Personal Estimates

* Description | *

* The contract of the contract of

Effort H samples Wadth H sheervations 334, 0000 34 238, 0000 203

Medal Megative Expenent(al beg. k(y) + Exp(-y/A(1))

Fereneter	Petni Estreate	Standard Errer	ef Variation	Cantidance	
A1 32	142.2 87727E-82	28.47 75652E-83	14.48	743975-02	184656-61

Program DIEINGE - Analysis of Distance Sampling Data 92.2 Centennial Pronchorn Herd - June 28-21, 1993

91/39/17 14:55 Fage 27

* Probability Function Estimation * * Chi-Square Geodomes of Fit Isst *

. That Courses of Freedom : 3

C+11	Feints		Taluss	Telunt	Values	
4		29.6	41.4	44.73	254	
	20.1	27.2	44.4	33.49	488	
2	57.2	314	77.4	79.93	900	
	114	IIH.	11.0	40.07	910	

Probability of a prester chi-square value S .48788

The program has limited capability for positing. The user should judge the necessity for positing and if necessary, do positing by hand

Fals C. Missz PASSY 13.007

FILE ASSESSED PARKET PROPERTY.

Program DISTANCE - Analysis of Distance Exempling Esta VI 2 Contennial Franchism Herk - June 28-21, 1993 Fare 24

Probability Function Extraction -fittenties Probability Fint -1.4733 9422 0 6114 " ... 3496 4100 .2075 .1578 ** .1578 ** .1578 ** .1578 ** 1570 229.000 57.298 24.608

Perpendicular distance in MILES

Frogram DITIAME - Analysis of Distance Campling Data VZ.2 Centennial Franchico Hard - June 28-21, 1973

81/38/77 14:55 Feat 24

- Probability Function Estimation - Model Selection/Fitting -

Effort | 224.0000 * tamples | 14 Wistin | 220.0000 * sheerestions | 295

Mate: The number of adjustment parameters allowed has been reduced to . I because of limited number of intervals

Medel I Malare Eate bey, ktyl = (- Exp(-1y/4(1))nm-a(2)) Espaite: Farmits:
Convergence was achieved with 12 function avaluations.
Final Ln(1)Melihood) value v -298.42977
Akaima (ndermation criterian v 781.44159
Final partmeter values) 54.135134 1.000000
mata Res parenter 2 is at a linear or pages bound.

Model 2

Marked Rate key. k(y) = 1 - Exp(-(y/A(1))==A(2))

Cooling adjustments of order(x) | 2 Trainits | Trainits |

Likelihand ratio test between models 1 and 2 Likelihand ratio test salas : 4882 Probability of a greater value : 497539 eme Dodal I calcuted over sodal 2 hazad an likelihand ratio test

81/38/37 14:55 74g* 25 Program SISIAMCE - Analysis of Sistance Sampline Date 92.2 Lectannial Promphorn Hard - Jame 28-21, 1983

- Pychability Function Estimator - Parameter Estimates

Effert # samples Hidth # sheepsetions 334.8800 14 226.6800 265

Hodel Marard Rate May, M(g) > 1 - E-p(-)y/A(1)100-A(2))

Parameter	Estimate	Errer	of Taristies	DS Park Confidence	
AL 41	64.14	24.17	34.35		
81 21	1.000	CETTS.	27.86		
F (0)	. R 3 9 2 1 K - H A	-12070E-02	14.30	433746-02	111491-01

Sampling Correlation of Estimated Parameters

A(1) A(2) A(1) 1 990 (1) A(2) 817 1 990

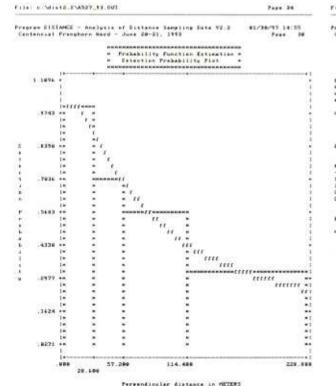
Program DISINGE - Analysis of Distance Employ Data W2.2 Cantennial Franchers Nord - Jane 28-21, 1993

- Frabability Function Estimation - Chi-Tquare Geodeses of Fit Test

C+11		1070	Yalust	Values	Talune.
- 1		28.6	49.4	44.69	. 910
2	28.6	57.2	48.4	33.94	154
	57.4	114	77.0	74.64	. 235
4	114.	229	49.4	49.74	1004
Tetal C	NI-TELET	velue -	. 5521 De	eress of Fr	endan = 1

Probability of a greater shirtness tales : 31851

The pregram has limited departitly for positing. The year should judge the necessity for positing and if necessary, 4s positing by hand.



File: v. Mintz, 254327, 31, 691

Page 36

Program BITIMSCE - Analysis of Eistanus Lampling Eata V2.2 Cantennial Franchers Nard - June 28-21, 1953

01/38/97 14:55 Page 3/

- Coperted Cluster Size Estimation

Effort # temples width # charrelines 224. 4444 245 245

Model Uniform May, h(y) = 1/4 Cesine adjustments of order(s) | 1

283

Expected cluster are extinated based on regression of: log(s(1)) on g(x(1))

347789 635841

.2544346-81 .211444 8297 .192501 .791157E-01

Expected cluster sam 4 1-4145 1 1.4421 514748-41

Pril (t)

Page 39 File: 8: Mist2.2 4527_52.007 teer 27 File: c: Mint2.2'M527_93.007 81/28/97 14:55 22 Program DISTANCE - Analysis of Distance Sampling Sata VS.S Contennial Promptorm Nace - June 29-22, 1999 Program D317AMCE - Analysis of Distance Easpling Eata W2.E Contennial Propphers Hers - June 28-21, 1883 81/29/27 14:35 Feet 37 Cluster Size Regression First - Cluster lise Regression flot 2.3491 1. 4422 2.0472 1 2258 1.4194 1.2030 1.2030 1141 4391 7,6300 3437 1437 157 314 471 488 795 235 392 548 784 914 471 428 785 142 292 549 786 463 1,020 . 942 1.828 233 970 Secontion Probability (ginl) Setestion Probability (pto)) CONT. ACMINIBED PASSES, NO. 119T. Page 38 THE CONTRACT STATES OF THE Page 44 Program DISTANCE - Analysis of Distance Empling Data VI.2 Contenned Programs Hard - June 29-21, 1993 Program EISENMEE - Analysis of Bislamos lampling Bata 92.2 Contential Progghorn Hard - Jone 28-21, 1913 81/39/97 14:55 PARY 36 \$1/38/37 14:33 Tage 34 - Espected Cluster lies Extination - Eugented Cluster bise Estimation -Effort 334.0000 W samples 14 width 226.0000 W sharrations 285 Effort * complex builth * abservations 134.0000 221 1000 241 Hodel
Uniform Neg, k(y) = 1/6
Casine adjustments of order(s) : 1, 2, 3 Maif-sures) key, k(y) + Exp(-y-m2/(lnk(1)-m2)) Cosine adjustments of order(s) | 2 Expected cluster tide estimated based on repression of: leg(s(1)) on gCollin) Espected silversy wine extinated hazed on regression of legistic) on assect); 1147536-01 104864 -0254 283 104102 7285366-65 494889 689187 Espected claster size = 1.4265 Standard apper : Espected cluster size # 1.4272 251425-41 Standard error Hear clubter size = 1.4423 Mean sleeter size : 1.4421 Standard error

Page 43 Page 41 File: 4: Mistz. 2'M527_88.00T File: 11N61448 2N6527 49 00T 91/38/37 14 35 Fage 39 Program SITINGS - Analysis of Distance Empline Data 92.2 Contennial Programmer Herd - June 28-21, 1958 Preurom DISTARCE - Analysis of Distance Lampling Data V2.2 Contential Precubers Need - June 29-21, 1952 #1/28/27 14:55 7444 37 - Cluster Size Aggression Plat Cluster Size Regression Fint 2.3484 2.4422 2.9622 1.7756 3.2758 1.4074 1.4894 1.19799365 ********* ** 6301 1.261 3427 3437 8573 anys . ******** ************* ** **** -357 -314 -471 -525 -785 -255 -212 -545 -786 942 157 235 252 -545 764 343 Detection Probability (atel) Detection Probability (ginl) Feet 188 Feet 42 FIRE CONTRACTOR OF PLIE C: MICHE ENABER, VO. DUT Frugram DISTANCE - Analysis of Distance Sampline Sate VS.2 Contental Franghton Hard - June 28-23, 1993 81/38/97 14:55 Feet 36 Program SISTAMES - Analysis of Distance Lengting Date VS 2 Cantennial Promphero Herd - June 28-21, 1992 91/38/97 14:55 Face 44 - Experted Claster Time Extraction -* Experied Cluster Size Stituation * Effect # samples kidth # sheepestimes: 334.0000 14 224.1000 265 Effect : * temples budth * observations: Findel
Hepative Exponential Rev. N(y) = Exp(-y/M(1)) Medali Metard Rate Say, big) : 1 - Esp(-ty/A(11)=m-A(21) Expected cluster size extincted based on regression of: log(s(i)) on g(s(i)) Expected aluster size extinated based on repression of: legislill on pictill Repressors Estimates 2989976-41 212724 4223 283 Slepe = | |sternept = | |Cappelation= |26 = | 14d arrar = 1 14d arrar = 1 1tudents-1 = Pr(T (1) = Sieps s intercept s Correlations Df c 432966E-01 212006 0227 263 \$14 errer = .113569 .721884E-91 301168 640318 394776-91 296718-41 Expected cluster tire = 1.4235 Standard ereer : 1.4421 Blandard error = 1.4421 Standard errer - 554745-41 Seas cluster size

File: 4: Mista. 2 M527_93.007 7 ese 45 Fromme DISTANCE - Analysis of Distance Sampling Data VS.2 Contennial Frombbon Hard - June 28-22, 1993 81/28/17 14:55 7000 41 . Cluster like Februarian Fint . 2.3406 2.6622 1.7750 23,29094 1.2030 9145 x 901 3437 6578157 .914 471 .226 .765 .142 .237 .242 .241 .784 442 1.828 871

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Save 47

Program 013IAME - Analysis of Distance Sameline Sate 93.3 Centennial Procedure Hard - June 29-21, 1333

81/38/97 14:55 Page 43

- Sensity Estimation - Results

Effort # tamples #|deb 334. 0000 14 228.000 285

Hedel 1 Uniform Day, http://discharge/ Coming adjustments of order(s) | 1, 2, 3

Farmathy	Foint Estimate	Standard Error	Parment Coof.	85 Pari	
(110)	\$2277E-82	114535-82	13.52	. 627138-92	147935-41
	33121	239465-81	13.12	40407	49493
ESW	121.54	14.919	13.32	12.649	159.46
4/2	17.727	- 51743	19.76	43473	1.1471
25	3.4423	1.1959	19.34	3.4279	4.3374
6111	1.4373	3344ZE-46	2.77	1.3518	1.2971
3	8.9434	10:3943	11.77	3.4458	14.741
196	9217.4	1038.2	39.72	4270 8	13748

Beasurement Units

Data (4) Monkey (70), HILES Else METORS

Compount Percentages of Variati

Detection probability 47.4 Commenter cate 40.3 Claster tile 1.9

FIRE COLORS PARTY STORE

Terr 56

From 41

Printed DISTANCE - Analysis of Distance Sampling Data ME.S. Goldennial Promptorn Hard - June 28-21, 1983

#1/38/97 14:55 feet 42

- Density Estimation
- Results

Detection Probability (plat)

Effort | * tamping | Midth | * observations 334, 0000 35 229.0000 285

Madel 1 Uniform key, b(y) = 1/4 Course adjustments of order(s) | 1

Parameter	Paint Estimate	Standard Serer	Percent Coef.	15 Fer- Confidence	interval
fib)	.79337E-92	361205-03	5.25	634516-42	777125-62
	62130	334506-61	5.25	56863	6007E
ESH	142.17	7:4704	5.25	120.27	127.24
mel.	#5325	/31745	13.76	43472	1-1471
D2	4.0295	71154	14.73	3.5458	4.5795
£423	1.4145	39194K-61	2.77	1.3396	1.4534
D	4.8314	1.8841	14.99	4.3344	5.3442
W .	2922:0	2289.7	14 44	5755 6	18774

Measurement Units

Hensity: Numbers/50. HILES ESH: METERS

Companient Percentages of VariD)

Detection probability | 12.8 Encounter yete | 84.3 Cluster size | 3.4

#1/38/97 14:55 7494 44

Program Ittracts - Analysis of Distance Sampling Data V2.2 Cantennial Fronghern Hard - June 29-21, 1972 Density Estimation Results

Effort # semples models # sheepedless: 334 9699 14 228 F888 285

Model 1
Raif-normal kmy, btg) = East-g-m2/(DoA(1)=m2))
Cosing adjustements of drawt(s) | 2

Parameter	Estimate	Errer	of Variation	Canfident	e laterval
£681	444555-82	.74148E-83	3.34	444395-02	.94143E-02
	54394	311111-41	9-36	45448	45567
ETH	124.91	11.437	9-34	184.41	100.02
w.	-65329	-11745	13.76	43472	1-1471
2.5	5.4967	91507	16.45	3.4178	7.7119
E(3)	1.4265	. 39564E-81	2.77	1.3518	1.5862
4	7.8418	1.3233	15.00	5.5637	31:346
N	1941.0	1525.9	15.14	6417. N	12736.

Seaturement Weite

Sensity: Munkers/50, MILES

Component Percentages of Yar(0)

Setestion probability : 30.0 Execution rate : 66.2 Cluster side : 2.7

File: 4: MI412.2'4527_13.00T

7 ege 45

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Page 51

Program DISTANCE - Analysis of Distance Empling Date WE.S Contennial Fromphore Herd - June 28-25, 1993

Entity Estimation

81/38/77 14:33 Feet 63

Program DISTANCE - Analysis of Distance Sampling Cate 48:8 Contampial Program Hard - June 28-03, 1993

81/38/97 14:55 Fage 47

Estimation Summary Encounter rates

Papied Estimates

164 95% Confidence Interval Estimate 13.76 13 53472 1.71471

Effort # samples Width # observations 334,0000 14 226,0000 263

Model 5 Magazine Espanential hee, k(y) = Ecol-y/A(1))

Terameter	Print Estimate	Standard Error	of Variation	55 Persont Confidence Inter-al	
££83	479298-42	75452E-83 42766E-81	*	743071-62	104958-01
E 244	113.79	9.7849	0.40	94 118	1.24.50
DS.	4.8274	11745	16.23	4.3244	8 4144
6.00	1.4268	1.4107	16.47	1.9531 6.1580	12.450
**	9138.8	1435.7	16.47	1891. 6	13983

Peasurement Units

Sansity: Numbers/SD: MILES Est: HETROS

Component Persontages of Variety

Detection probability Encounter rate Cluster tire

CALAD ALMERARIZMANEZ TRADUT

Pegs 20

FIRE SINGLESS ENAMED 39, 507

Dept. Dil.

Propries DISTANCE - Analysis of Distance Sampling Sate VS.S Contennal Propplays Hard - June 29-21, 1993 81/38/97 14:35 feet 44

Bunsite Estimation

Estudio

Effort H samples Hidth H observations 334.0000 14 220.1000 205

Hodel 1 Hexard Kate beg. htp://i Exp(-(g/Atillme-Atill)

Parameter	Point Standard Estimate Error		of Variation	55 Percent Confidence Interval	
(18)	. 639216-62	129706-62	14.36	. 633762-82	11109E-01
	-S2883	244676-81	14.31	37263	48941
E.Sad	119 14	17.139	14:34	98.418	157.74
net-	65321	111745	43.76	63477	1:1471
DE	5.7622	1.1471	19.93	3.4815	0.5548
E457	1.4225	.35477E-81	2.76	1.3472	1.1828
D	8.1567	1.4476	28.18	5.5835	12.211
H	9451.0	1699.7	28.16	1344. F	14888

Heasurement Units

Density: Munders/50. miles ESH: METERS

Component Percentages of Var(D) Detection probability | 31.2 Encounter rate | 46.9 Cluster size | 1.9 Fregram Distance - Analysis of Distance Sampling Data Td.J. Centennial Promptorn Here - June 28-21, 1992

#1/28/17 14:15 7490 40

		- Estimation Dumary					
Proles Estina	tes)	Estimate	9£9	48	15: Coefide	ACE INTERNAL	
Uniter-Casa		1.0000					
	ALC	792.04					
	Chi-p	13149					
	11(4)	793376-83	5.25	204	434590-92	77962E-82	
		. F2110	3.25	294	36861	48874	
	£34	142.17	5.25	294	120.27	157.50	
Sanfare/Essay					525000	4.5	
		3.4444					
	41C	243.33					
	(14)	#2277E-82	13.93	292	62713E-93	197556-91	
		33121	13.52	202	44412	69691	
	TTW.	121.54	13.92	282	12.640	139.44	
WALF-DRIVENING	de line	377077	70000				
2017/12/2017		2.0044					
	ASE	783.15					
	Chica	222236					
	1101	144555-82	9.34	293	-66659E-62	961438-62	
		54594	9.34	203	45469	65567	
	834	124.91	9.34	383	164.91	159.92	
May Englished							
		3.4444					
	ALC	771.35					
	Chare	44389					
	(41)	479298-82	9.50	284	74387E-92	1,44936-41	
		42799	0.40	294	42894	38619	
	Ellie	113.72	8.68	284	96,110	134.58	
Mazard/Cesine							
	***	2.4999					
	ASC	791.64					
	Churp	31931					
	1(6)	.03321E-02	14.38	593	E3374E-83	.111098-01	
		52961	14.38	293	25343	68741	
	\$22.00	147.15	14.38	283	98:815	157 74	

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Program DISIANCE - Analysis of Distance Sampling Sate V2.2 Centranial Promphers Herd - June 20-22, 1992

11/38/27 14:55 Ferr - G

Extlestion Summary & Expected cluster side *

Posted Estina	1000					
PROTES EXCLUSION		Estimate	HEW	44	95× Eeste	dense (aterna)
Average silves			7000	1.000	901-00	11,000,023
	# F S h	1.4423	4.32	284	1.3362	1.54.85
Unitered Course						
		204455-93				
	4-1	43584				
	REED .	1.4145	2.77	243	1.2378	1.4134
Owlfore/Term						
All versa error and or	ar.	247751-81				
	***	48571				
	8053	1.4279	8.22	24.3	1.3516	1.3471
Half-normal/L	**16*					
HELL CONTRACTOR		21350E-R1				
	page .	64717				
	EC11	1.4245	2.77	20.3	1.3316	1 2842
The Tan/Lucia					100000000000000000000000000000000000000	
tesh substitution		226728-01				
		64832				
	6(1)	1.4244	2.70	211	1.3711	1.5047
2000 - 002 - 2000 000 0	. 64.65	3.14044	301.00		1-4544	21.000
Maxand/Cueins						
		. SECTION				
	Cini	65035	- 111	200	111111111111111111111111111111111111111	
	E4.53	1.4225	8.79	283	1.3472	1.7438

File: «: Mintz. PASSY, 83-OVE

Feet 24

Fragram Dillamik - Analysis of Distance Lampines Data WZ Z Centennial Franghern Hard - June 28-21, 1993

#1/78/77 15:55 Fees 58

* Estimation Summary *

		- Desiry/Abendesia = assumented antiquente						
Fooled Easier								
		Estimate	VCV.	st	Fin Cantil	sease Interval		
Unitere/Corr	nw:							
	.01	9.8835	24.73	17	3.5450	4 . 2715		
	D	6.8314	14.88	1.0	4. 2244	1.3442		
		7677.6	14.11	10	5758.0	19774.		
Uniform/Coni	**							
	0.1	5.6493	19.50	.53	3 8271	6.3374		
	D	0.0634	19.77	53	5.4458	11.541		
	840	9297.0	19.77	5.9	4474.4	13768.		
Habif - narrea Life	Cesane							
	0.8	3.4947	26.65	28	3.9178	7.7119		
	D	7.8458	26.00	29	5.5655	33.946		
	44	3041.8	16.60	29	6417.8	12724		
her Esp/Cent	ne							
	2.5	6.6374	16.73	25	4.2366	8.4164		
		8.6142	16.47	24	4.1530	11.414		
	94	1932.8	16.47	26	7975.4	13103		
Hazard/Essan		10000000						
	25	3.7622	19.95	54	3.0015	8.5548		
		8.1967	28.18	54	5.5919	12.231		
	B	9451.6	20.16	54	6344.0	14004		