UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

MINERAL DEPOSIT GRADE-TONNAGE MODELS

By D. A. Singer and D. L. Mosier, Editors

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INTRODUCTION

A compendium of 18 grade-tonnage models is presented as an aid in mineral resource assessments. These models should be used in conjuction with the descriptive ore deposit models assembled by D. P. Cox (1983). Fifteen of the grade-tonnage models have direct analogs with the models presented by Cox. Grade-tonnage models for skarn copper associated with porphyry copper, laterite nickel of the oxide type, and general porphyry copper do not yet have associated descriptive models. Although both the descriptive and the grade-tonnage models were prepared for an assessment of the country of Colombia, the models are in most cases generalized and applicable elsewhere.

Estimated premining tonnages and average grades of well-explored prototype deposits of each type were used to construct the grade-tonnage models. Where several different estimates were available for a deposit, the estimated tonnage and average grades associated with the lowest cutoff grade were used. Grades not available were treated as zero. Because over 1700 deposits were employed constructing these models, references are only provided to data sources where one or two sources were used.

The grade-tonnage models are presented in graphical form in order to make it easy to compare deposit types and to display the data. All plots of the same commodity or tonnage are presented on the same scale on the x-axis, while the y-axis is always the cumulative proportion of deposits. Deposits, plotted as dots, are cumulated from the lowest tonnage or grade to the highest. With the exception of iron grade, all original tonnage

and grade units were transformed so that they would plot on a single page; a logarithmic transformation was used for tonnage and copper grade, whereas a square root transformation was used for all other grades. Values on the x-axis were transformed back to the original units and rounded to two significant places. The curve through the plotted deposits was hand drawn to provide a general guideline. Connected to this curve are lines representing the 90th, 50th, and 10th percentiles and the associated values of the observed frequency. The number of deposits employed for each model is given on the upper right of each plot. Correlations among grades and tonnages are reported in the text when significant.

DEPOSIT TYPE Podiform chromite MODEL NUMBER 1.1

AUTHOR D. A. Singer

DATA REFERENCES Singer and others, 1980; Calkins and others, 1978.

COMMENTS All deposits are from California and Oregon. The two largest tonnage deposits are actually districts rather than individual deposits. The majority of the grades represent shipping grades. Grades less than 35 percent typically represent in place "ore". The mixture of shipping grades and in place grades may explain the significant negative correlation ($r = -0.22$) between grade and tonnage.

DEPOSITS

Name	Country	Name	Country
Ace of Spades	USCA	Black Chrome	USCA
Adobe Canyon Gp.	USCA	Black Diamond	USOR
Alice Mine	USCA	Black Diamond (Grey Eagle Gp.)	USCA
Allan (Johnson)	USCA	Black Hawk	USOR
Alta Hill	USCA	Black Otter	USOR
Althouse	USOR	Black Rock Chrome	USCA
Alyce and Blue Jay	USCA	Black Streak	USOR
American Asbestos	USCA	Black Warrior	USOR
Anti Axis	USCA	Blue Brush	USCA
Apex (Del Norte Co.)	USCA	Blue Creek Tunnel	USCA
Apex (El Dorado Co.)	USCA	Blue Sky (Lucky Strike)	USCA
Applegate	USOR	Boiler Pit	USCA
Associated Chromite	USOR	Booker Lease	USCA
Babcock	USOR	Bonanza	USCA
Babyfoot	USOR	Bowden Prospect	USCA
Beat	USCA	Bowie Estate	USCA
Big Bear	USOR	Bowser	USOR
Binder No. 1	USCA	Bragdor	USCA
Big Bend	USCA	Briggs Creek	USOR
Big Chief	USOR	Brown Scratch	USOR
Big Dipper (Robr)	USCA	Bunker	USCA
Big Four	USOR	Burned Cabin	USOR
Big Pine Claim	USCA	Butler Claims	USCA
Big Yank No. 1	USOR	Butler, Estate Chrome, etc.	USCA
Black Bart (Great Western)	USCA	Buttercup Chrome	USCA
Black Bart Claim (Avery)	USCA	Camden Mine	USCA
Black Bart Group	USCA	Camptonville area	USCA
Black Bear	USCA	Castro Mine	USCA
Black Beauty	USOR	Cattle Springs	USCA
Black Boy	USOR	Cavyell Horse C	USOR

(continued on next page)

DEPOSIT TYPE Podiform chromite MODEL NUMBER 1.1

DEPOSITS (continued)

Name	Country	Name	Country	Name	Country
Cavyell Horse Mountain	USOR	Eden	USCA	Harp and Sons Ranch	USCA
Cedar Creek	USOR	Eggling and Williams	USCA	Hawks Rest View	USOR
Challange area	USCA	El Primero	USCA	Hayden and Hilt	USCA
Chicago	USCA	Elder Claim	USCA	Helemar	USCA
Christain Place	USCA	Elder Creek	USCA	Hendricks No. 2	USCA
Chrome Camp	USCA	Elder Creek Gp.	USCA	High Dome	USCA
Chrome Gulch	USCA	Elk Creek Claim	USCA	High Plateau	USCA
Chrome Hill	USCA	Elkhorn Chromite	USOR	Hill-Top Chrome	USCA
Chrome King	USOR	Ellingwood	USCA	Hodge Ranch	USCA
Chrome King	USOR	Ellis	USCA	Hoff	USCA
Chrome No. 3	USOR	Esterly Chrome	USOR	Holbrook and McGuire	USCA
Chrome Ridge	USOR	Esther and Phyllis	USCA	Holseman (and others)	USCA
Clara H	USCA	Fairview	USCA	Holston (Vaughn)	USCA
Clary and Langford	USCA	Fiddler's Green	USCA	Horseshoe	USCA
Cleopatra	USOR	Fields and Stoker	USCA	Horseshoe Chrome	USOR
Clover Leaf	USCA	Finan	USCA	Houser & Burges	USOR
Codd Prospect	USCA	Forest Queen	USCA	Hudson (Fuller Claims)	USCA
Coggins	USCA	Foster	USOR	I-Wonder	USCA
Collard Mine	USOR	Four Point	USOR	Illinois River	USOR
Commander	USCA	Fourth of July	USCA	Independence	USOR
Coon Mt. Nos. 1-3	USCA	French Hill	USCA	Irene Chromite	USOR
Copper Creek (Low Divide)	USCA	Friday	USOR	Iron Mountain	USOR
Courtwright	USCA	Gallagher	USOR	Jack Forth	USCA
Courtwright (Daggett)	USCA	Gardner Mine	USOR	Jack Sprat Gp.	USCA
Crouch	USOR	Gas Canyon	USCA	Jackson	USOR
Crow Creek Gp.	USCA	Geach	USCA	Jim Bus	USOR
Crown	USOR	Bibsonville	USCA	Johns	USOR
Cyclone Gap	USCA	Glory Ho	USOR	Josephine	USCA
Cynthia	USOR	Griffin Chromite	USOR	Josephine No. 4	USOR
Daisy (Aldelabron)	USCA	Gill (Gill Ranch)	USCA	Judy (Hicks)	USCA
Dark Star	USOR	Gillan	USCA	Julian	USCA
Darrington	USCA	Gillis Prospect	USCA	Kangaroo Court Mine	USCA
Deep Gorge Chrome	USOR	Golconda Fraction	USCA	Kleinsorge Gp.	USCA
Detert	USCA	Gold Bug Claim	USCA	Kremmel and Froelich	USCA
Diamond	USCA	Goncolda	USOR	Lacey	USCA
Dickerson	USCA	Gray Boy	USOR	Lambert	USCA
Dickey and Drisbach	USCA	Gray Buck Gp.	USOR	Langley Chrome	USOR
Dirty Face	USOR	Green (Americus)	USCA	Lassic Peak	USCA
Doe Flat	USCA	Green Mine	USCA	Last Chance	USOR
Don Pedro	USCA	Green Ridge	USCA	Last Chance	USOR
Dorriss	USCA	Green's Capco Leases	USCA	Laton	USCA
Dozier	USCA	Gunn Claims	USCA	Letty	USCA
Earl Smith	USCA	Half Chrome	USCA	Liberty	USCA
Early Sunrise	USOR	Hanscum	USOR	Liberty Bond Claim	USCA
Edeline	USCA	Happy Go Lucky	USCA	Linda Marie	USOR

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DEPOSIT TYPE Podiform chromite MODEL NUMBER 1.1

DEPOSITS (continued)

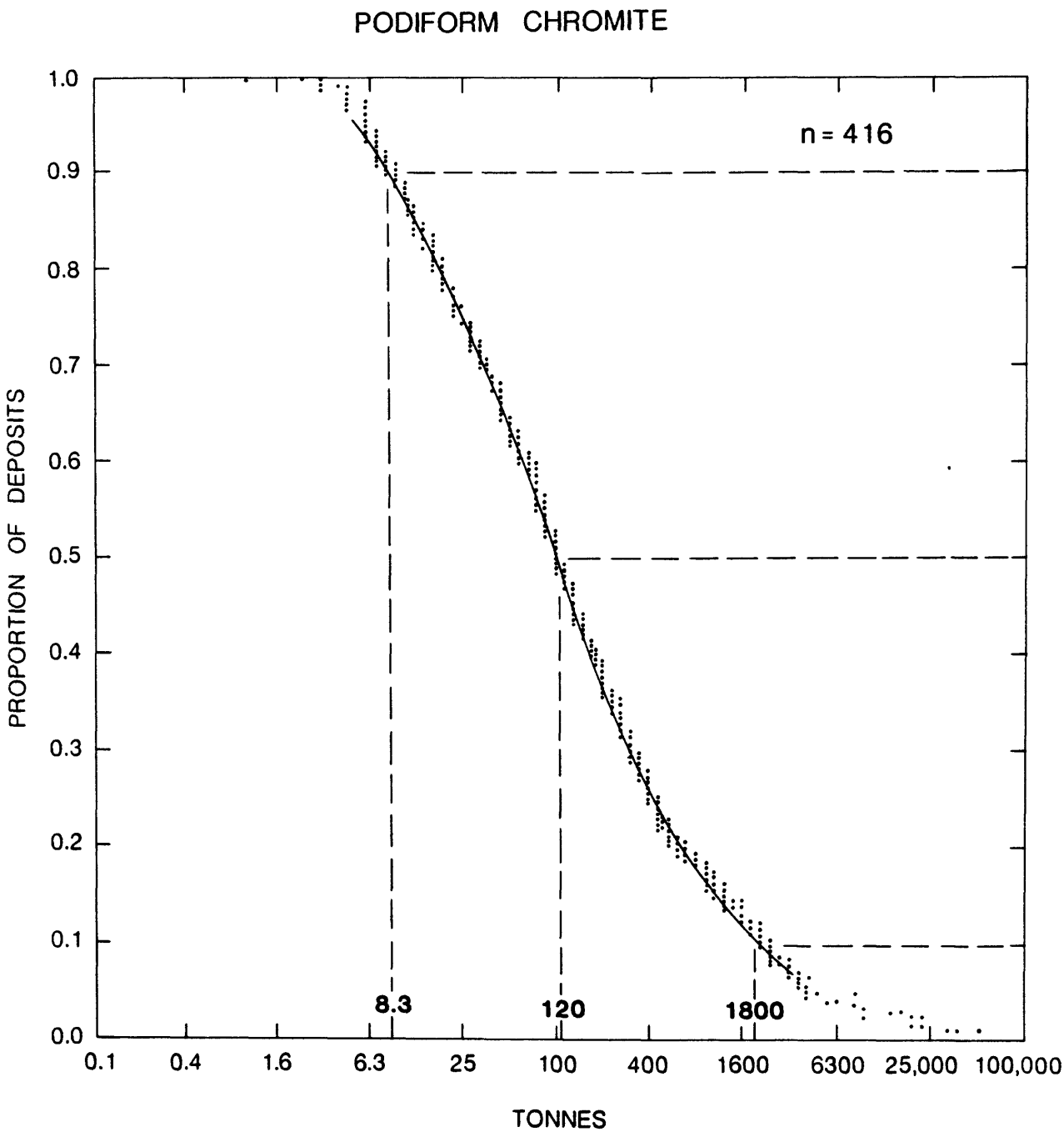
Name	Country	Name	Country
Little Boy	USOR	Mountain View Gp.	USCA
Little Castle Creek	USCA	Mulcahy Prospect	USCA
Little Hope	USCA	Mule Creek	USCA
Little Rock Mine	USCA	Mum and Alice June Claim	USCA
Little Siberia	USOR	MuNaly	USCA
Lone Gravel	USCA	Murphy	USCA
Long Ledge Gp.	USCA	Muzzleloader (Stevens No. 1)	USCA
Lost Lee	USOR	New Hope	USCA
Lotty	USCA	New Hope Claim	USOR
Lucky Boy	USCA	Newman	USCA
Lucky Friday	USOR	Nichelini Mine	USCA
Lucky Girl	USCA	Nickel Mountain	USOR
Lucky Hunch	USOR	Nickel Ridge	USOR
Lucky L. & R.	USOR	No. 5	USCA
Lucky Nine Gp.	USOR	Noble Electric Co.	USCA
Lucky Star	USOR	Norcross	USCA
Lucky Strike	USCA	North End, West End, Spotted Fawn	USCA
Lucky Strike	USCA	North Fork Chrome	USCA
Lucky Strike	USOR	North Star	USOR
Lucky Strike	USOR	North Star (Red Mtn)	USCA
Mackay	USCA	Oak Ridge	USCA
Madeira	USCA	Olive B.	USOR
Madrid	USCA	Olsen	USCA
Manchester	USCA	Onion Springs	USOR
Maralls Capro Leases	USCA	Oregon Chrome	USOR
Mary Jane	USCA	Oxford	USCA
Mary Walker	USOR	P. U. P. (Zenith)	USCA
Maxwell	USCA	Paradise No. 1	USOR
Mayflower	USCA	Paradise No. 2	USOR
McCaleb's Sourdough	USOR	Park's Ranch	USCA
McCarty	USCA	Parker	USCA
McCormick	USCA	Parkeson	USCA
McGuffy Creek Gp.	USCA	Pearsoll Peak	USOR
McMurty	USCA	Peewan	USCA
Meeker (Sonoma Chrome)	USCA	Peg Leg (Lambert)	USCA
Merrifield	USCA	Pennington Butte	USOR
Mighty Joe	USOR	Perconi Ranch	USCA
Milton	USCA	Pillikin	USCA
Mockingbird	USOR	Pine Mountain Claim	USCA
Moffett Creek Gp.	USCA	Pines	USOR
Mohawk Claim	USOR	Pleasant No. 1 & 2	USOR
Moore	USCA	Poco Tiempo Quartz	USCA
Moscatelli	USCA	Poodle Dog	USCA
Moscatelli No. 2	USCA	Pony Shoe	USCA
Mountain View	USCA	Porter Property	USCA

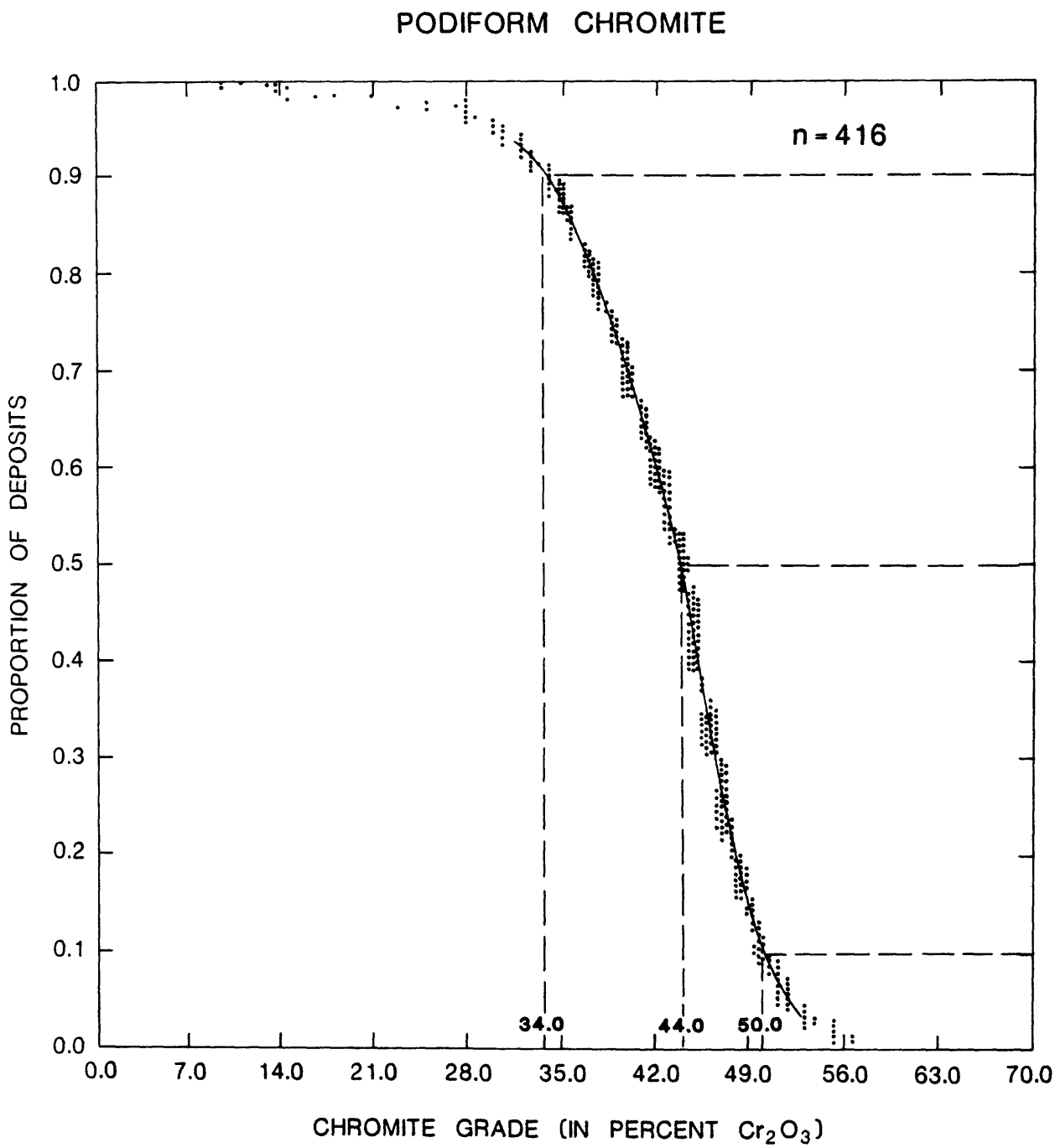
(continued on next page)

DEPOSIT TYPE Podiform chromite MODEL NUMBER 1.1

DEPOSITS (continued)

Name	Country	Name	Country	Name	Country
Prater	USOR	Snakehead (Jumbo)	USCA	Unknown	USOR
Pyramid	USCA	Snowy Ridge	USCA	Unknown	USOR
Quigg	USCA	Snowy Ridge	USOR	Unknown	USOR
Rainbow	USOR	Snyder	USCA	Unknown	USOR
Rainy Day	USOR	Sour Dough	USOR	Unknown	USOR
Rancherie	USOR	Sousa Ranch	USCA	Unknown	USOR
Randall	USCA	Southern Pacific Property	USCA	Unknown	USOR
Rattlesnake Mountain	USCA	Spot	USCA	Unknown	USOR
Red Ledge	USCA	Spring Hill	USCA	Unknown	USOR
Red Mountain	USOR	Stafford	USCA	Valen Prospect	USOR
Red Slide Gp.	USCA	Stark Bee	USCA	Valenti	USCA
Redskin	USCA	State School	USCA	Victory No. 3	USCA
Richards	USCA	Stevens-Miller	USOR	Violet	USOR
Richey, U.S. & S.J.	USCA	Stewart	USCA	Vogelgesang	USCA
Robt. E.	USOR	Store Gulch	USOR	Wait	USCA
Rock Creek	USOR	Stray Dog	USOR	Waite	USCA
Rock Wren Mine	USCA	Sullivan and Kahl	USCA	Walker	USCA
Rose Claim	USCA	Sunnyslope	USCA	War Bond	USCA
Rosie Claim	USOR	Sunrise	USCA	War Eagle-Miller	USCA
Round Bottom	USCA	Sunset	USCA	Ward and Lyons	USCA
Roupe	USCA	Sunset	USCA	Washout	USCA
Sad Sack	USOR	Sunshine	USCA	Welch Prospect	USCA
Saddle Chrome	USOR	Sutro Mine	USCA	West Chrome	USCA
Saint	USCA	Suzy Bell (Lucky Strike)	USCA	Western Magnesite	USCA
St. Patrick (Camp 8)	USCA	Swayne	USCA	White Bear	USCA
Sally Ann	USOR	Sweetwater	USCA	White Cedar	USCA
Salt Rock	USOR	Tangle Blue Divide	USCA	White Feather	USCA
Saturday Anne	USOR	Tennessee Chrome	USOR	White Pine Mine	USCA
Schmid	USOR	Tennessee Pass	USOR	Wild Cat Claim	USOR
Seiad Creek (Mt. View)	USCA	Thompson Gp.	USOR	Wilder (Fish Creek)	USCA
September Morn	USCA	Toujours Gai	USCA	Windy Point	USOR
Sexton Mountain	USOR	Trinidad	USCA	Wolf Creek	USCA
Shade Chromite	USOR	Twin Cedars	USOR	Wolf Creek area	USCA
Shady Cove	USOR	Twin Valley	USOR	Wonder	USOR
Shafer Lease	USCA	Tomkin	USCA	Wonder Gp.	USOR
Shamrock	USCA	Uncle Sam	USOR	Yellow Pine	USCA
Shelly	USCA	Unamed	USCA	Young	USOR
Sheppard Mine	USCA	Unknown	USOR	Young's Mine	USOR
Shotgun Creek	USCA	Unknown	USOR	Zerfirg Ranch	USCA
Simmons	USCA	Unknown	USOR		
Simon	USCA	Unknown	USOR		
Sims	USCA	Unknown	USOR		
Six-Mile	USOR	Unknown	USOR		
Skyline Mine	USCA	Unknown	USOR		
Skyline No. 1	USCA	Unknown	USOR		
Skyline No. 2	USCA	Unknown	USOR		


PODIFORM CHROMITE
n = 416
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
8.3
120
1800
0.1
0.4
1.6
6.3
25
100
400
1600
6300
25,000
100,000
TONNES


PODIFORM CHROMITE
n = 416
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
34.0
44.0
50.0
0.0
7.0
14.0
21.0
28.0
35.0
42.0
49.0
56.0
63.0
70.0
CHROMITE GRADE (IN PERCENT Cr_2O_3)

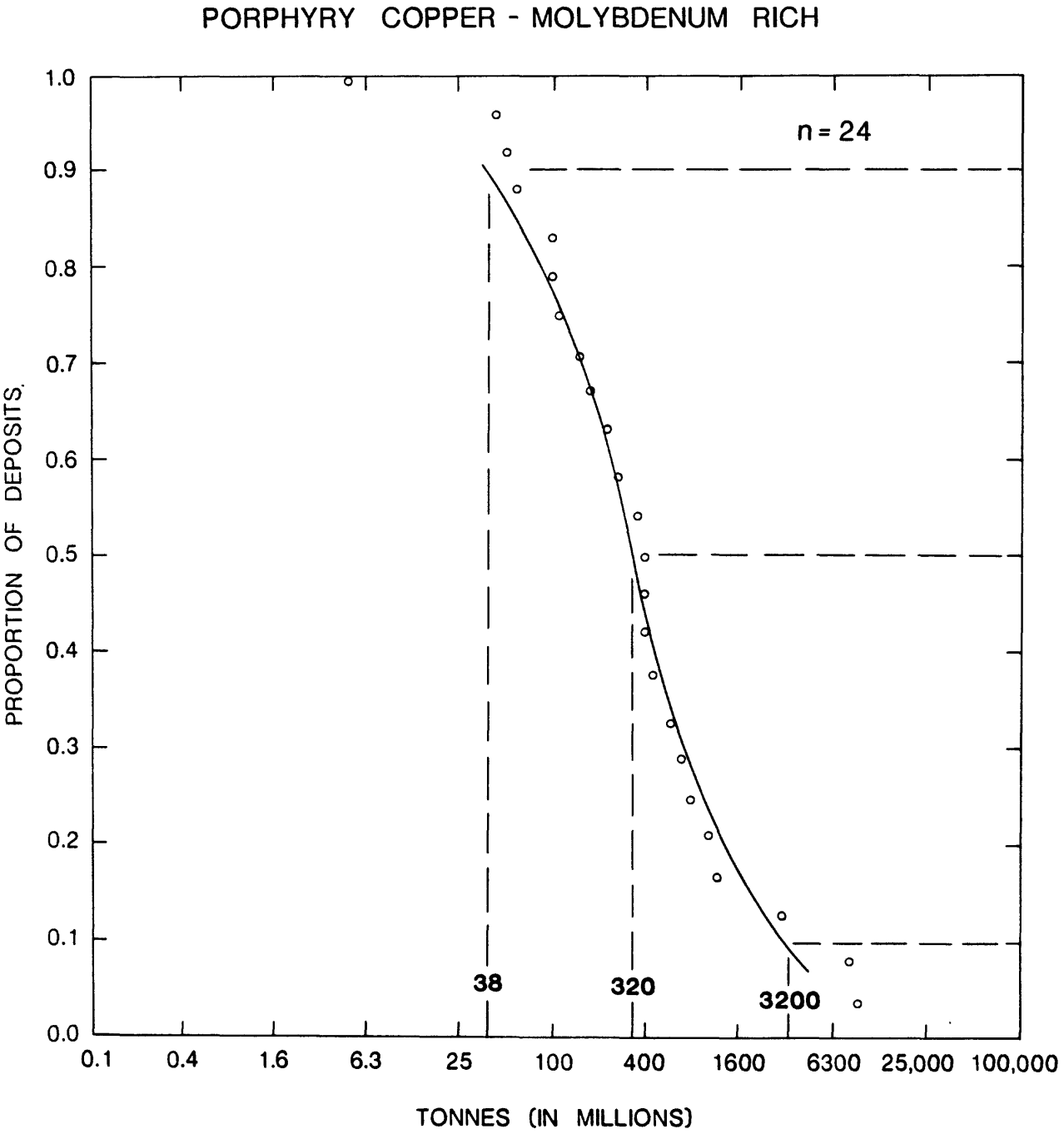
DEPOSIT TYPE Porphyry copper--molybdenum rich MODEL NUMBER 2.1

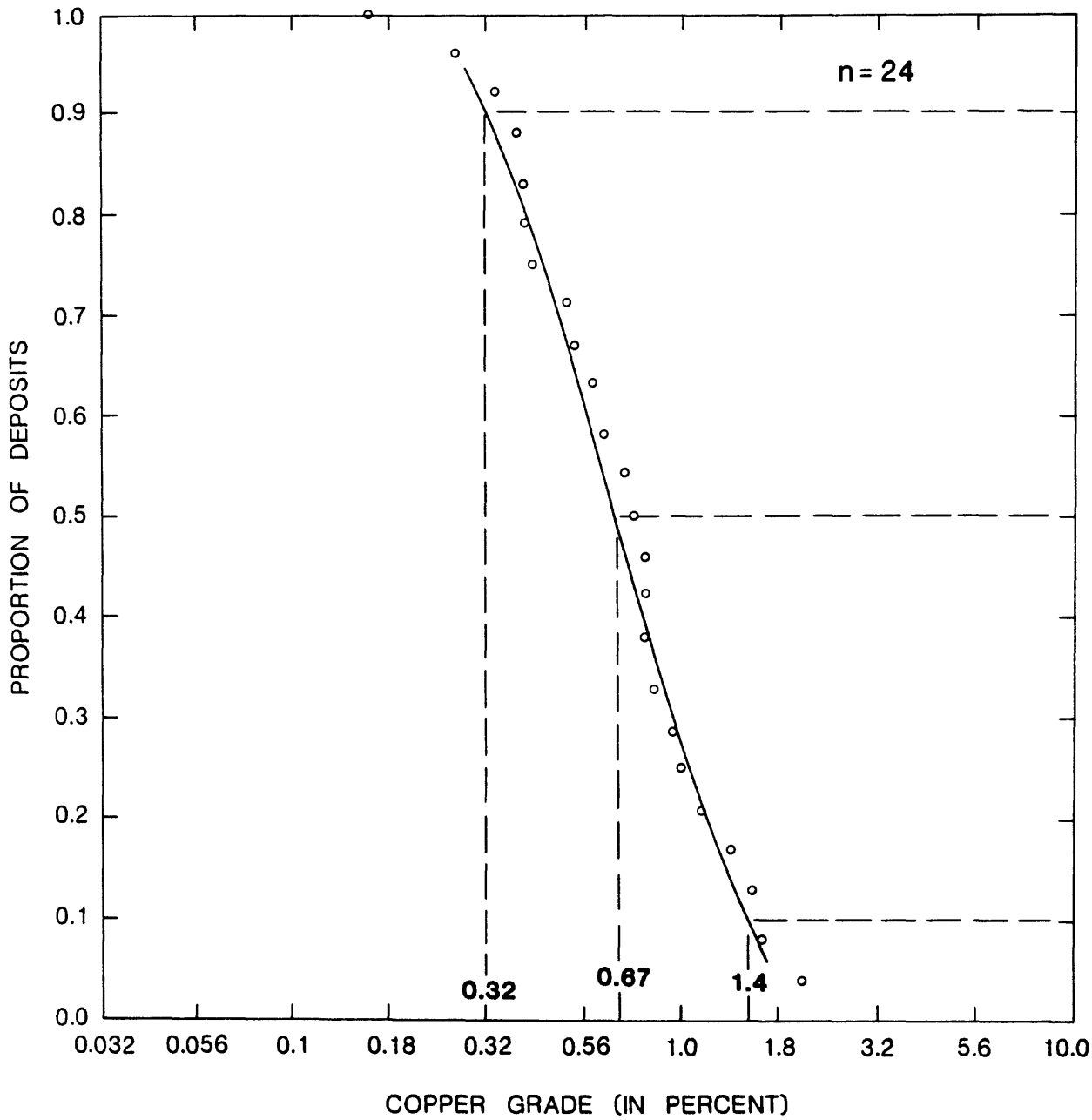
AUTHOR D. A. Singer and D. L. Mosier

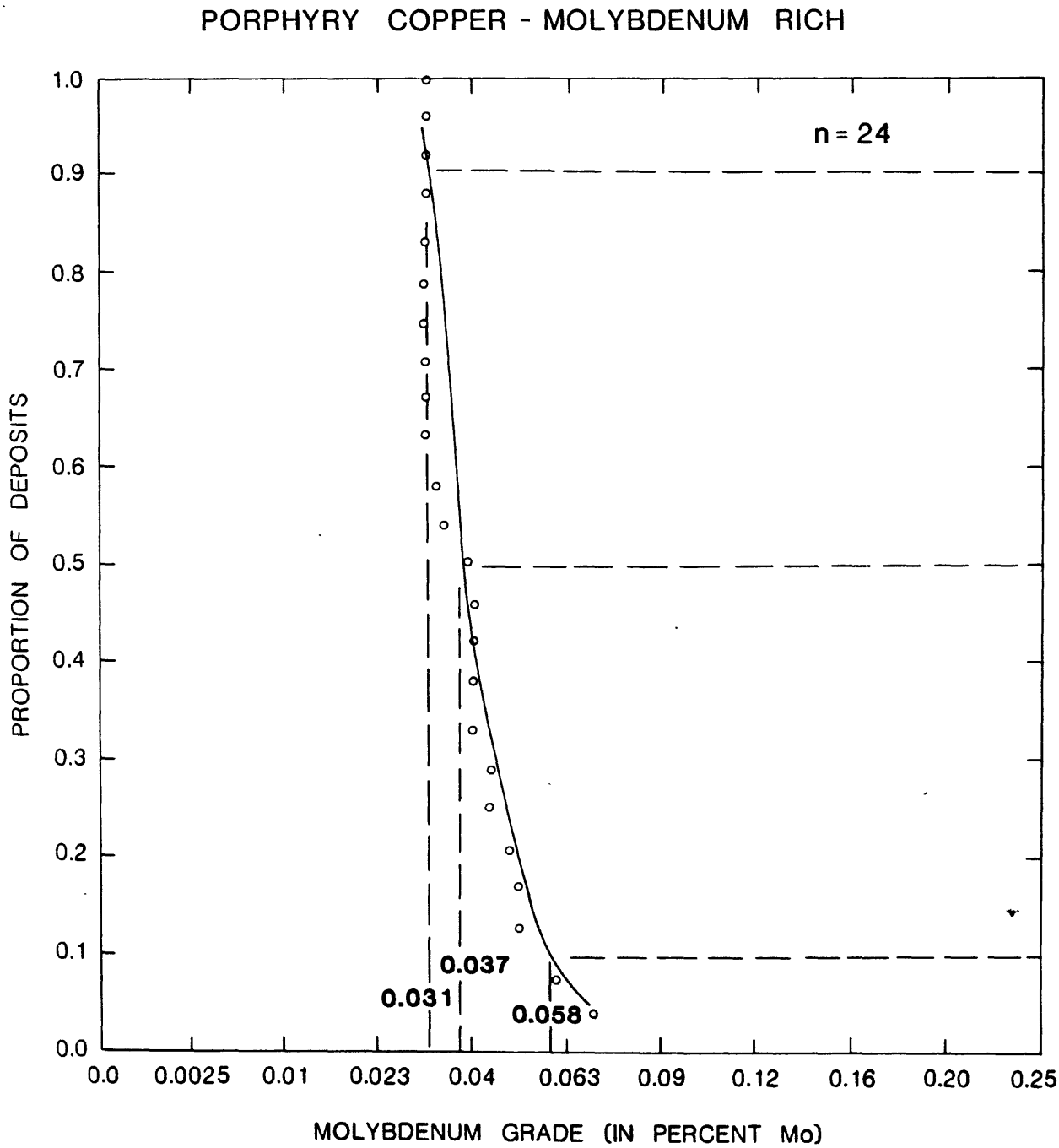
COMMENTS All porphyry copper deposits with reported molybdenum grades greater than 0.0299 percent were included in these plots. The grade for inclusion was arbitrarily selected. The criterion used to select deposits for these plots is not the same as that presented by Cox (1983).

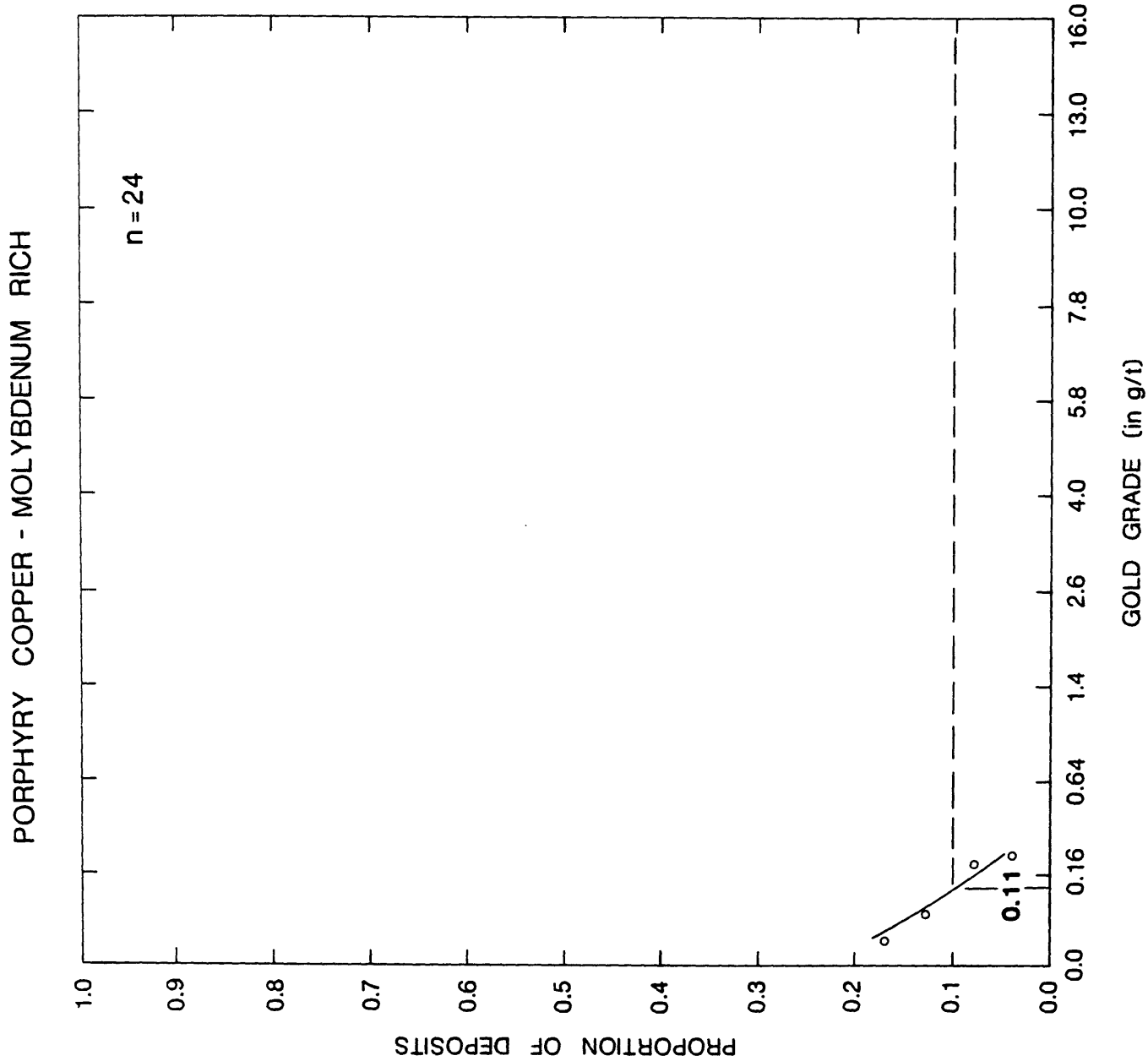
DEPOSITS

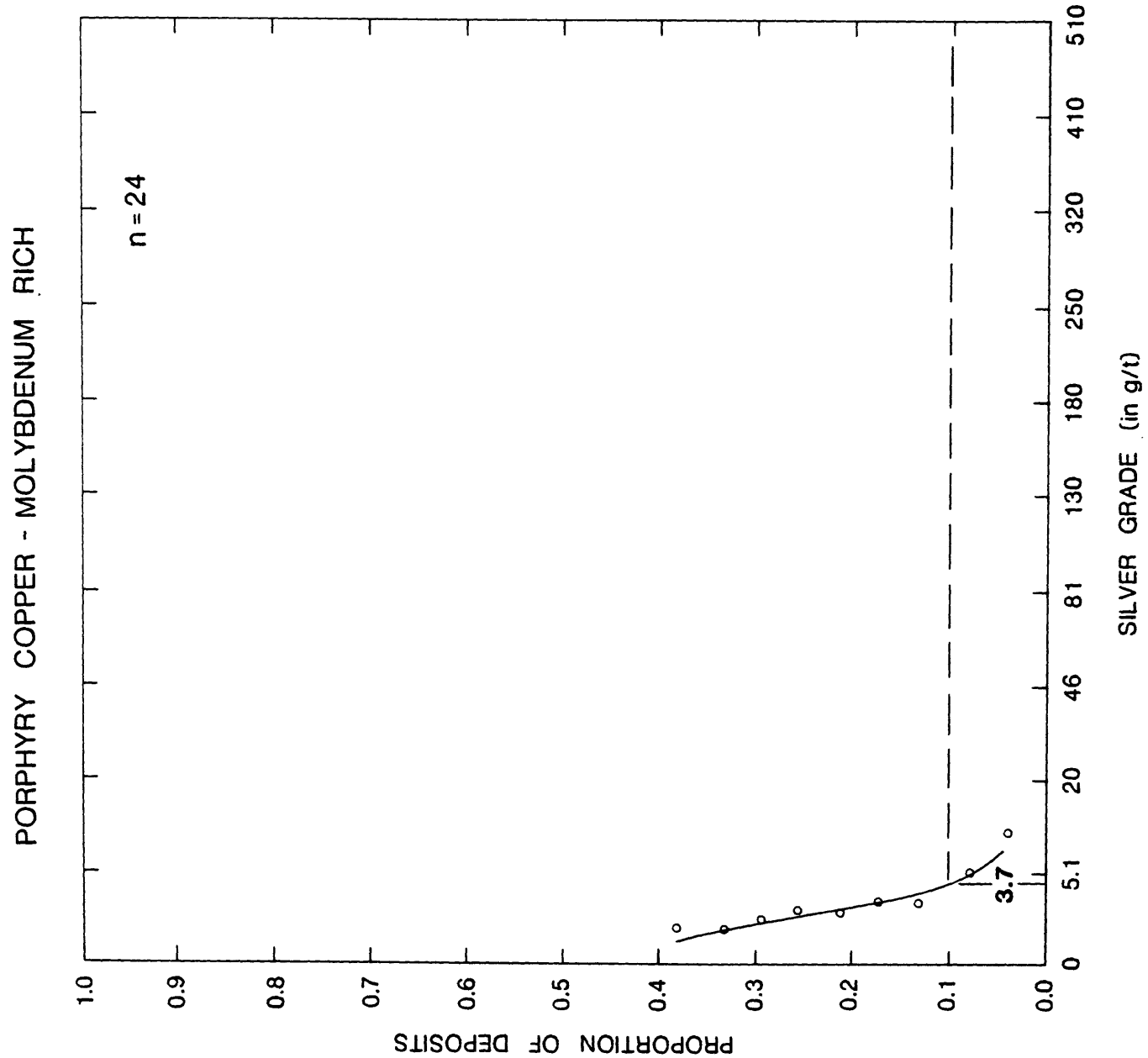
Name	Country
Ann	CNBC
Berg	CNBC
Bingham	USUT
Brenda	CNBC
Brenmac	USWA
Cerro Blanco	CILE
Chapi	PERU
Chaucha	ECDR
Chuquicamata	CILE
Cuajone	PERU
El Salvador	CILE
El Teniente	CILE
Esperanza	USAZ
Glacier Peak	USWA
Ithica Peak	USAZ
Kadzharan	URAM
Los Pelambres	CILE
Michiquillay	PERU
Mocoa	CLBA
Paramillos	AGTN
Pashpap	PERU
Quelleveco	PERU
Sar Cheshmeh	IRAN
Toquepala	PLPN


PORPHYRY COPPER - MOLYBDENUM RICH
n = 24
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
38
320
3200
0.1
0.4
1.6
6.3
25
100
400
1600
6300
25,000
100,000
TONNES (IN MILLIONS)


PORPHYRY COPPER - MOLYBDENUM RICH
n = 24
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.32
0.67
1.4
0.032
0.056
0.1
0.18
0.32
0.56
1.0
1.8
3.2
5.6
10.0
COPPER GRADE (IN PERCENT)


PORPHYRY COPPER - MOLYBDENUM RICH
n = 24
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.031
0.037
0.058
0.0
0.0025
0.01
0.023
0.04
0.063
0.09
0.12
0.16
0.20
0.25
MOLYBDENUM GRADE (IN PERCENT Mo)


PORPHYRY COPPER - MOLYBDENUM RICH
n = 24
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.11
0.0
0.16
0.64
1.4
2.6
4.0
5.8
7.8
10.0
13.0
16.0
GOLD GRADE (in g/t)


PORPHYRY COPPER - MOLYBDENUM RICH
n = 24
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
5.1
20
46
81
130
180
250
320
410
510
SILVER GRADE (in g/t)
3.7

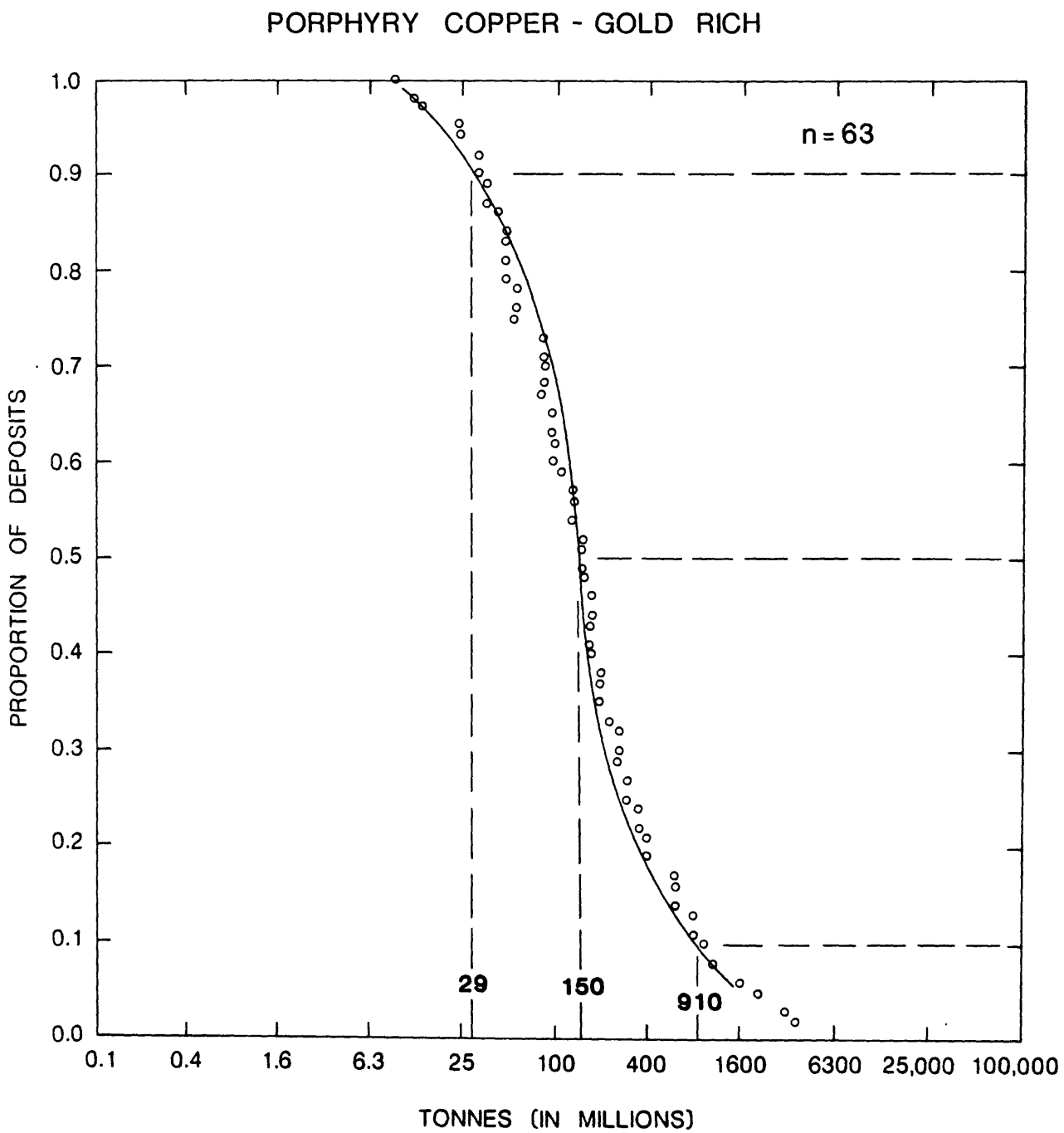
DEPOSIT TYPE Porphyry copper--gold rich MODEL NUMBER 2.2

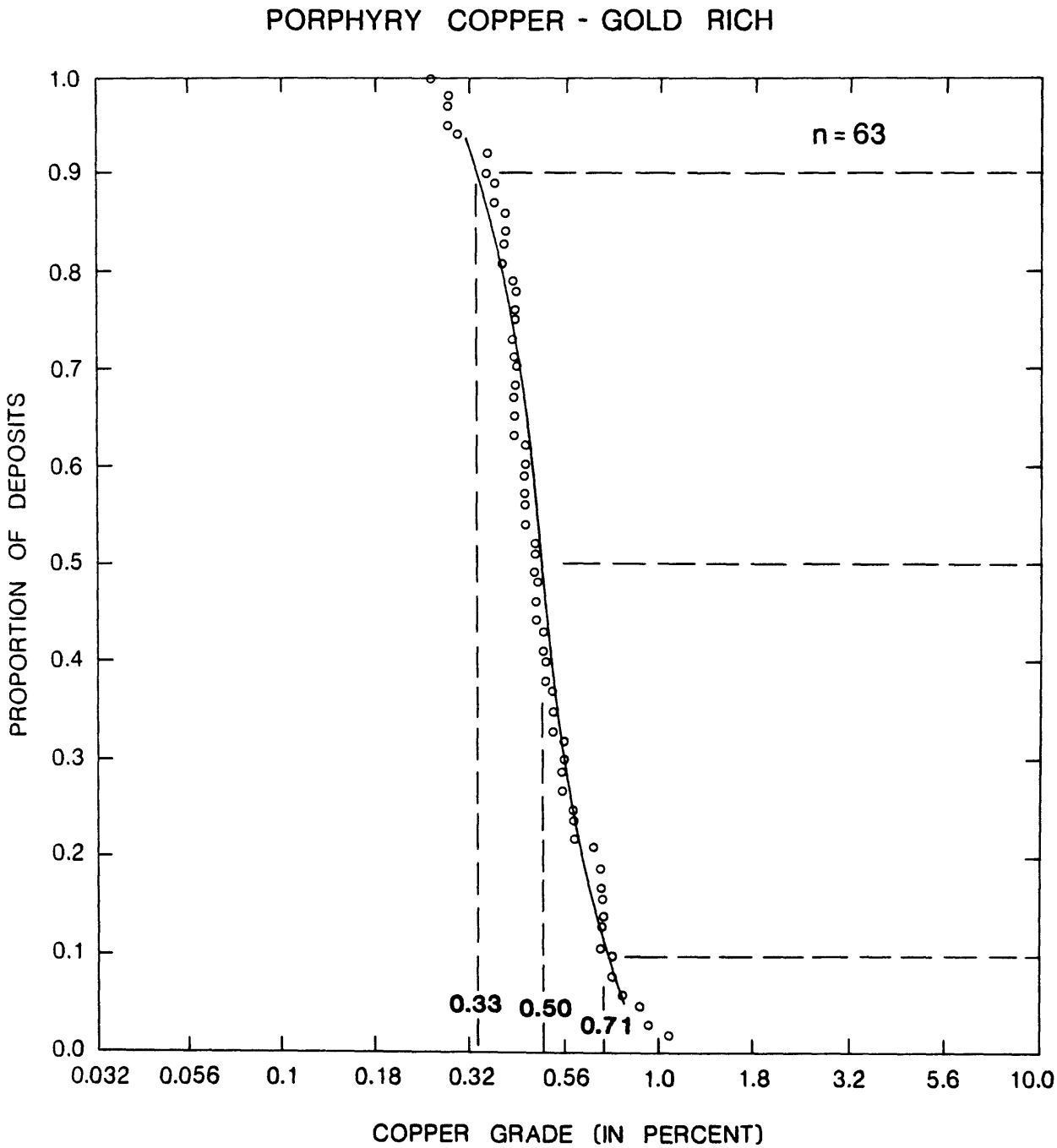
AUTHOR D. A. Singer and D. P. Cox

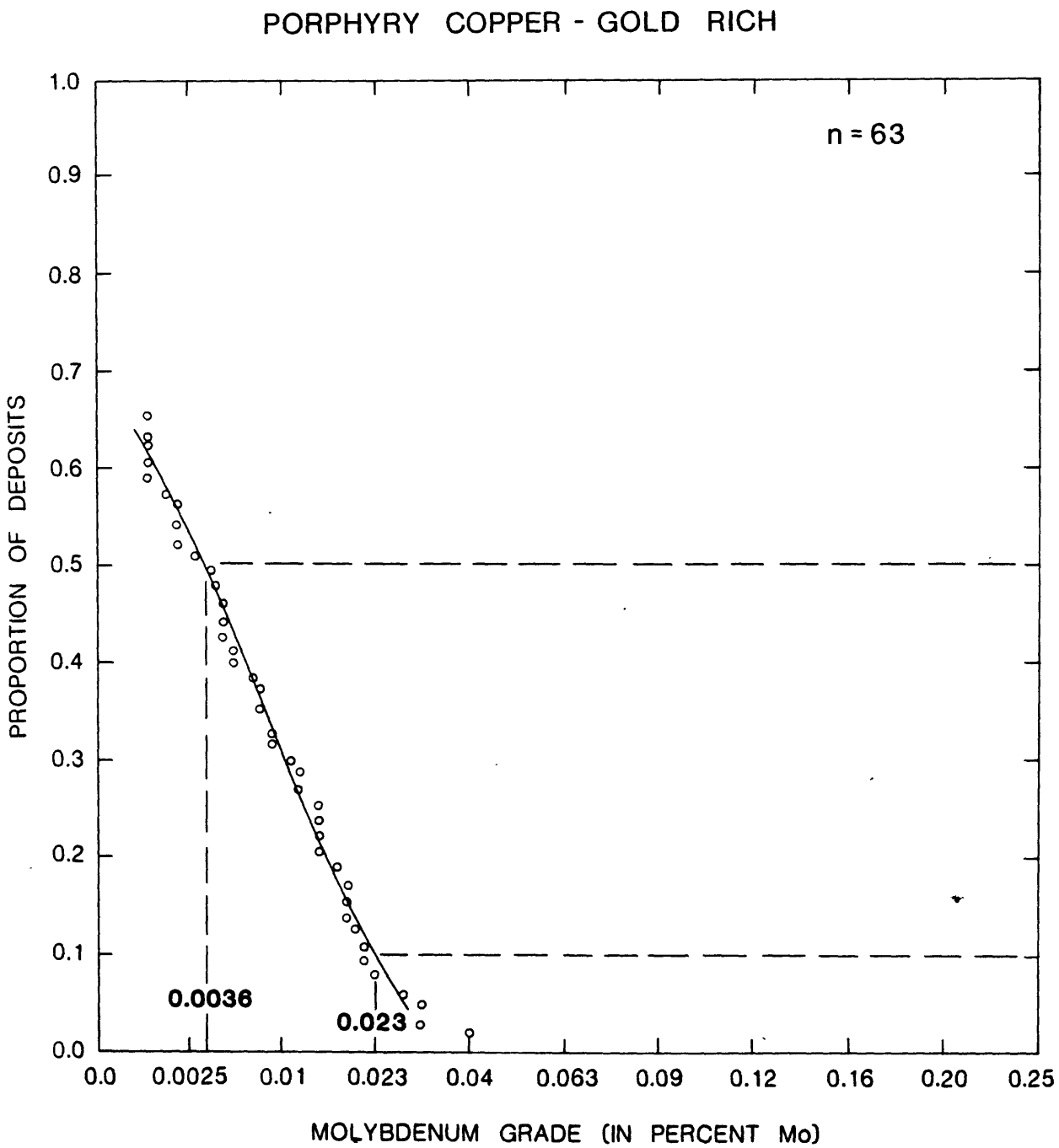
COMMENTS Porphyry copper deposits with reported gold grades greater than or equal to 0.034 g/t were included in these plots. The criterion for selection is based on the results of Sinclair and others (1982). Molybdenum grades are negatively correlated with gold grades (r = -0.49).

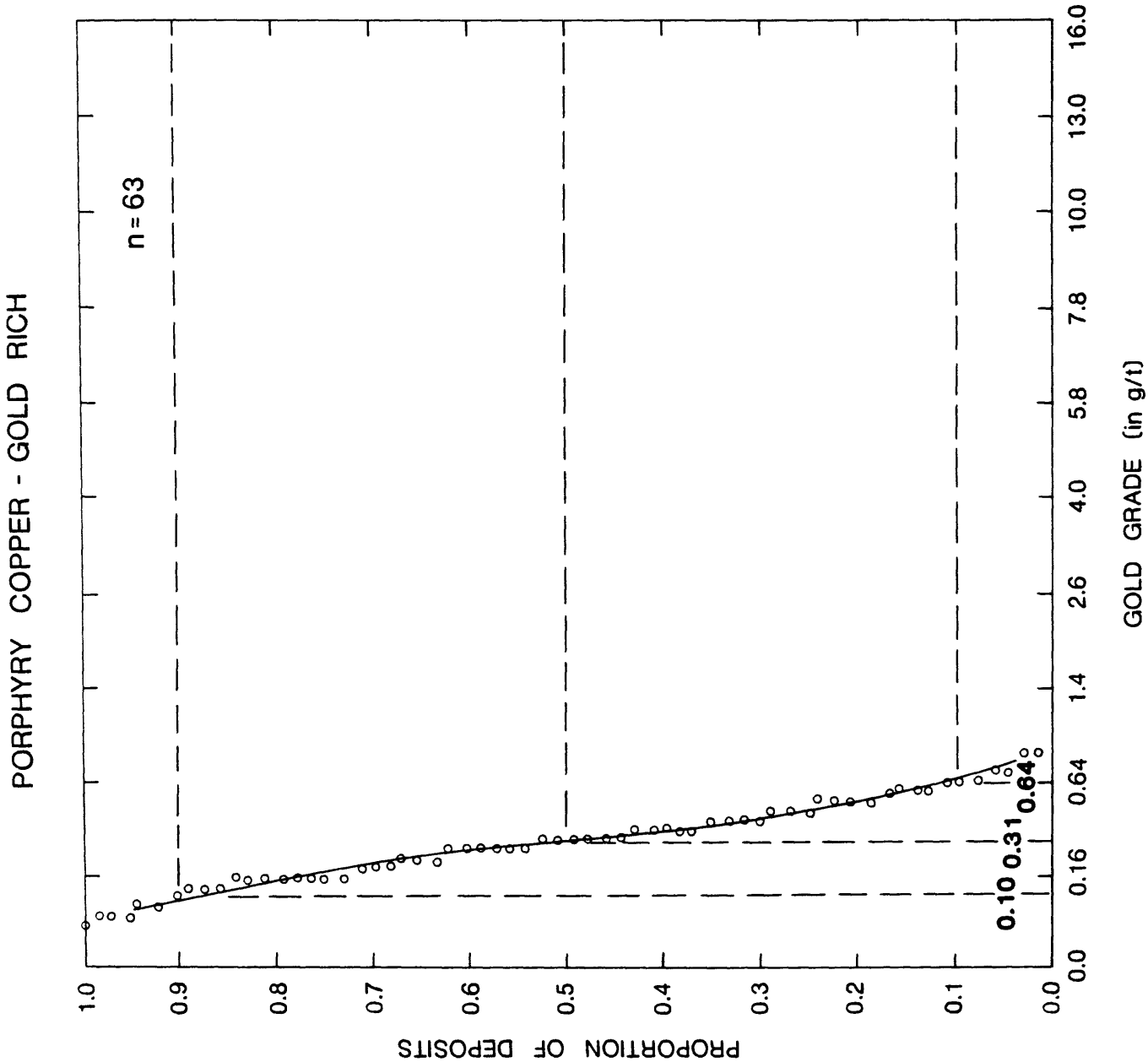
DEPOSITS

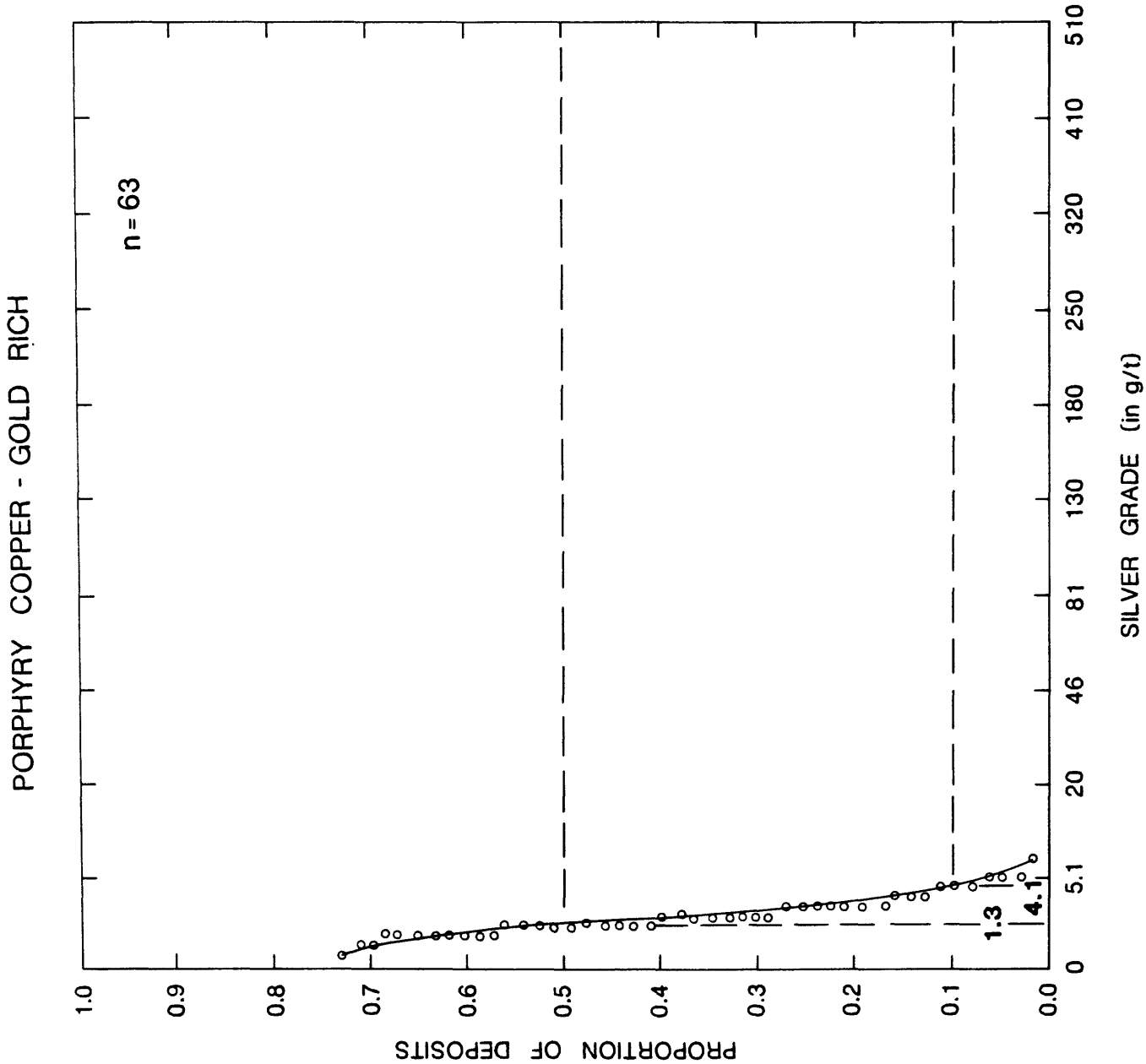
Name	Country	Name	Country
Afton	CNBC	La Alumbrera	AGTN
Ajo	USAZ	La Verde	MXCO
Amacan	PLPN	Lorraine	CNBC
Andacolla	CILE	Lumbay	PLPN
Atlas Lutopan	PLPN	Mamut	MDGS
Basay	PLPN	Mapula	PLPN
Bell Copper	CNBC	Marcopper	PLPN
Berg	CNBC	Marian	PLPN
Bingham	USUT	Morrison	CNBC
Boneng Lobo	PLPN	Mountain Mines	PLPN
Brenmac	USWA	Ok Tedi	PPNG
Cariboo Bell	CNBC	Orange Hill	USAK
Cash	CNYT	Panguna	PPNG
Casino	CNYT	Poison Mountain	CNBC
Cerro Colorado	PANA	Red Chris	CNBC
Copper Mountain	CNBC	Rio Vivi	PTRC
Cubuagan	PLPN	Safford (PD)	USAZ
Dexing	CINA	Saindak South	PKTN
Dizon	PLPN	San Antonio	PLPN
Ely	USNV	San Fabian	PLPN
Fish Lake	CNBC	Santo Nino	PLPN
Frieda River	PPNG	Santo Tomas	PLPN
Galore Creek	CNBC	Schaft Creek	CNBC
Gambier Island	CNBC	Sipalay	PLPN
Gaspe	CNQU	Star Mt.-Fubilan	PPNG
Granisle	CNBC	Star Mt.-Futik	PPNG
Hillsborough	USNM	Tanama	PTRC
Hinobaan	PLPN	Tawi-Tawi	PLPN
Ingerbelle	CNBC	Taysan	PLPN
Island Copper	CNBC	Toledo	PLPN
Kalamazoo	USAZ	Yandera	PPNG
Kennon	PLPN		


PORPHYRY COPPER - GOLD RICH
n = 63
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
29
150
910
0.1
0.4
1.6
6.3
25
100
400
1600
6300
25,000
100,000
TONNES (IN MILLIONS)


PORPHYRY COPPER - GOLD RICH
n = 63
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.032
0.056
0.1
0.18
0.32
0.56
1.0
1.8
3.2
5.6
10.0
0.33
0.50
0.71
COPPER GRADE (IN PERCENT)


PORPHYRY COPPER - GOLD RICH
n = 63
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0036
0.023
0.0
0.0025
0.01
0.023
0.04
0.063
0.09
0.12
0.16
0.20
0.25
MOLYBDENUM GRADE (IN PERCENT Mo)


PORPHYRY COPPER - GOLD RICH
n = 63
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.16
0.64
1.4
2.6
4.0
5.8
7.8
10.0
13.0
16.0
GOLD GRADE (in g/t)
0.10
0.31
0.64


PORPHYRY COPPER - GOLD RICH
n = 63
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1.3
4.1
0
5.1
20
46
81
130
180
250
320
410
510
SILVER GRADE (in g/t)

DEPOSIT TYPE Porphyry copper MODEL NUMBER none

AUTHOR D. A. Singer, D. L. Mosier, and D. P. Cox

COMMENTS All porphyry copper deposits with available grades and tonnages were included in these plots in order to provide a model for cases where it is not possible to use the gold-rich or molybdenum-rich models. Parts of the porphyry copper deposits which could be considered skarn were removed from these data and put into the copper skarn-porphyry copper model. Silver grades are positively correlated with molybdenum grades ($r = 0.25$) and with gold grades ($r = 0.27$). In both cases there are a large number of zero grades which could affect the correlations.

DEPOSITS

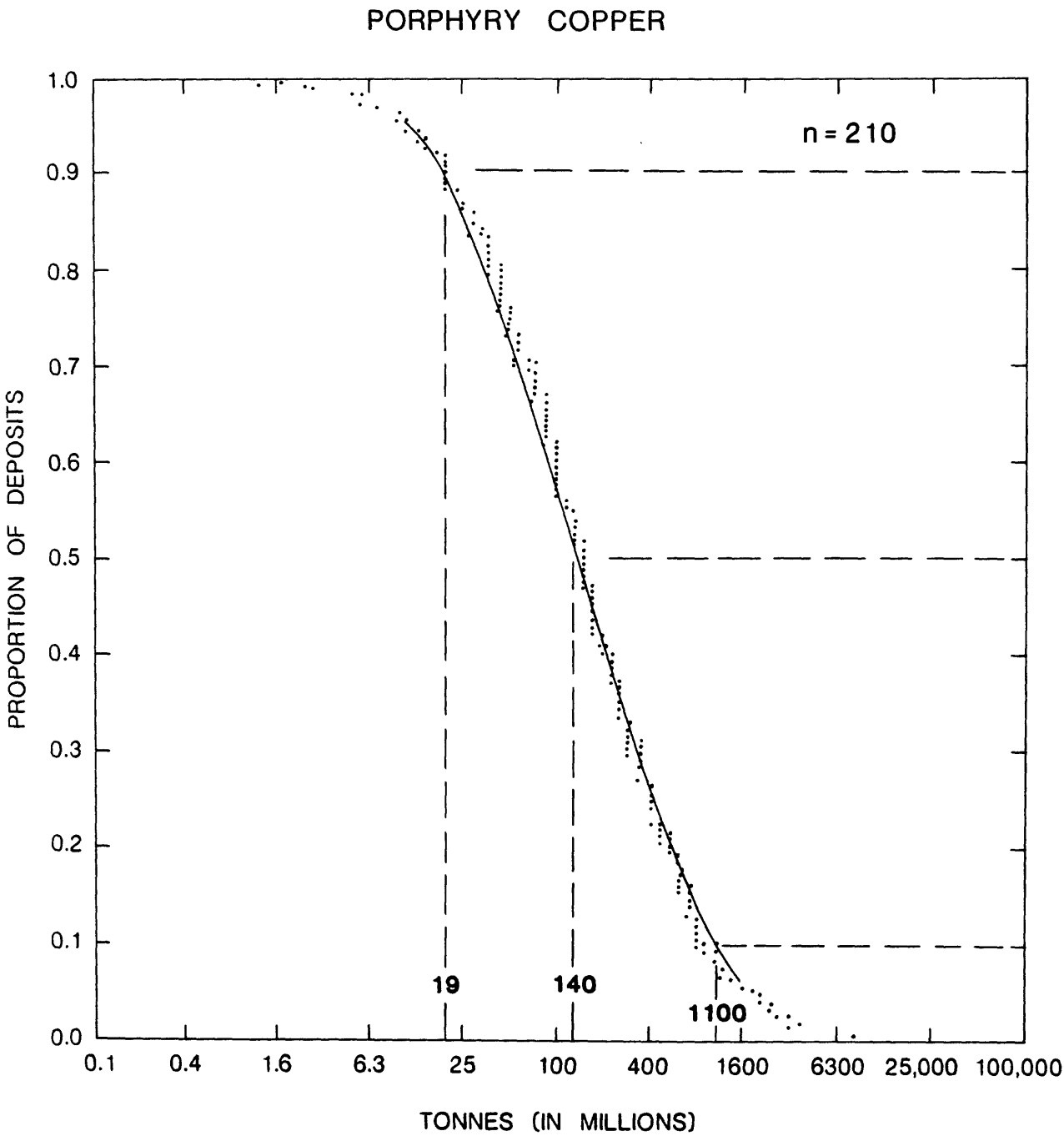
Name	Country	Name	Country	Name	Country
Adjuntas	PTRC	Brenda	CNBC	Cubuagan	PLPN
Afton	CNBC	Brenmac	USWA	Dexing	CINA
Ajax	CNBC	Butilad	PLPN	Dizon	PLPN
Ajo	USAZ	Butte	USMT	Dorothy	CNBC
Am	CNBC	Campanamah	AGTN	Eagle	CNBC
Amacan	PLPN	Cananea	MXCO	El Abra	CILE
Andacolla	CILE	Canariaco	PERU	El Arco	MXCO
Ann	CNBC	Cariboo Bell	CNBC	El Pachon	AGTN
Ann Mason	USNV	Carpenter	USAZ	El Salvador	CILE
Arie	PPNG	Cash	CNYT	El Soldado	CILE
Atlas Carmen	PLPN	Casino	CNYT	El Teniente	CILE
Atlas Frank	PLPN	Castle Dome	USAZ	Elatsite	BULG
Atlas Lutopan	PLPN	Catface	CNBC	Ely	USNV
Axe	CNBC	Catheart	USMN	Escondita	CILE
Aya Aya	PLPN	Cerro Blanco	CILE	Esperanza	CILE
Bagdad	USAZ	Cerro Colorado	CILE	Exotica	CILE
Basay	PLPN	Cerro Colorado	PANA	Fish Lake	CNBC
Bear	USNV	Cerro Verde	PERU	Florence	USAZ
Bell Copper	CNBC	Chapi	PERU	Frieda River	PPNG
Berg	CNBC	Chaucha	ECDR	Galaxy	CNBC
Bethlehem	CNBC	Chuquicamata	CILE	Galore Creek	CNBC
Big Onion	CNBC	Coalstoun	AUQL	Gambier Island	CNBC
Bingham	USUT	Copper Basin	USAZ	Gaspe	CNQU
Bisbee	USAZ	Copper Cities	USAZ	Gilbraltar	CNBC
Bluebird	USAZ	Copper Creek	USAZ	Glacier Peak	USWA
Bond Creek	USAK	Copper Mountain	CNBC	Granisle	CNBC
Boneng Lobo	PLPN	Cordon	PLPN	Hale-Mayabo	PLPN
Bozshchaku	URUR	Cuajone	PERU	Heddleston	USMT

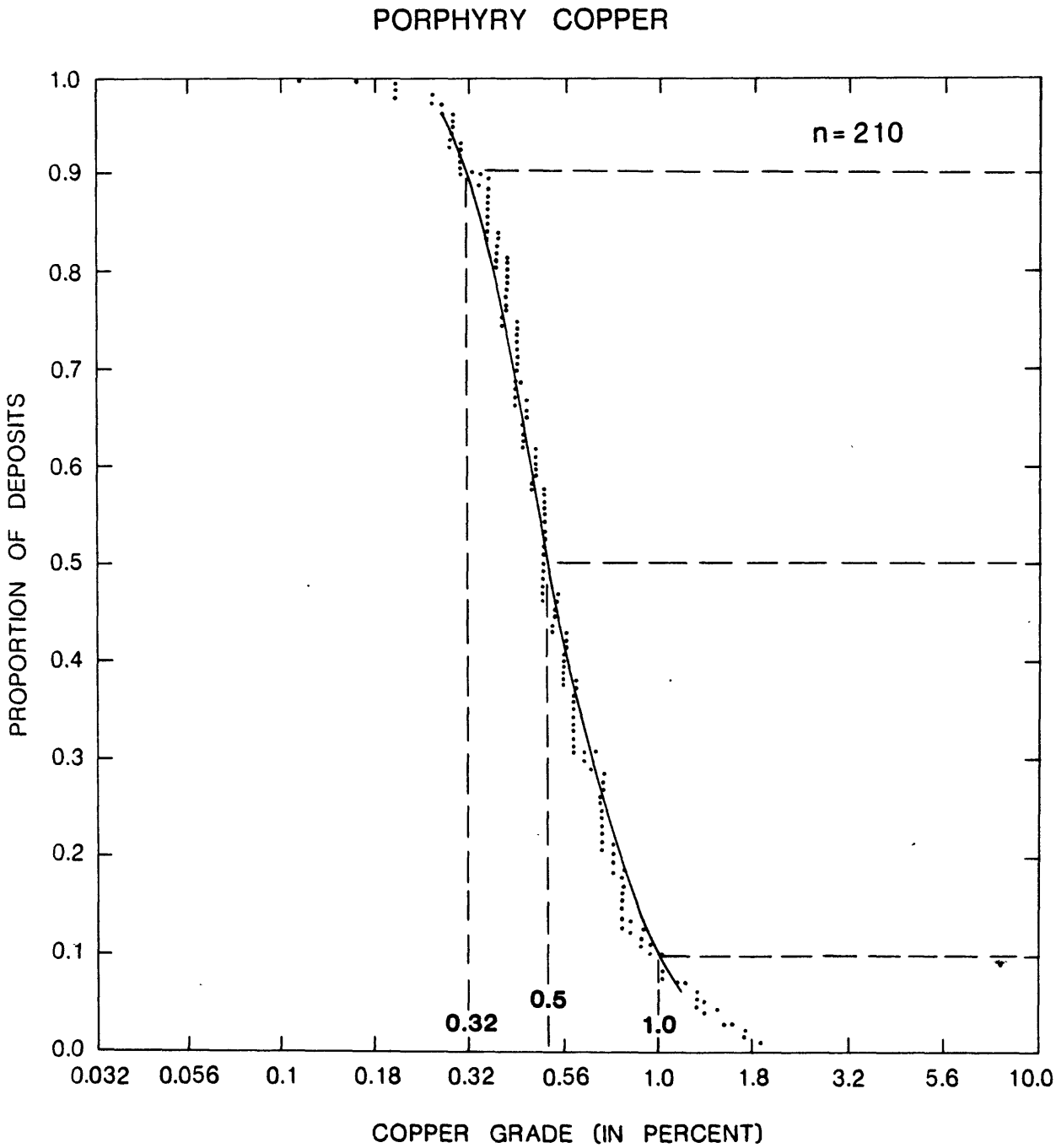
(continued on next page)

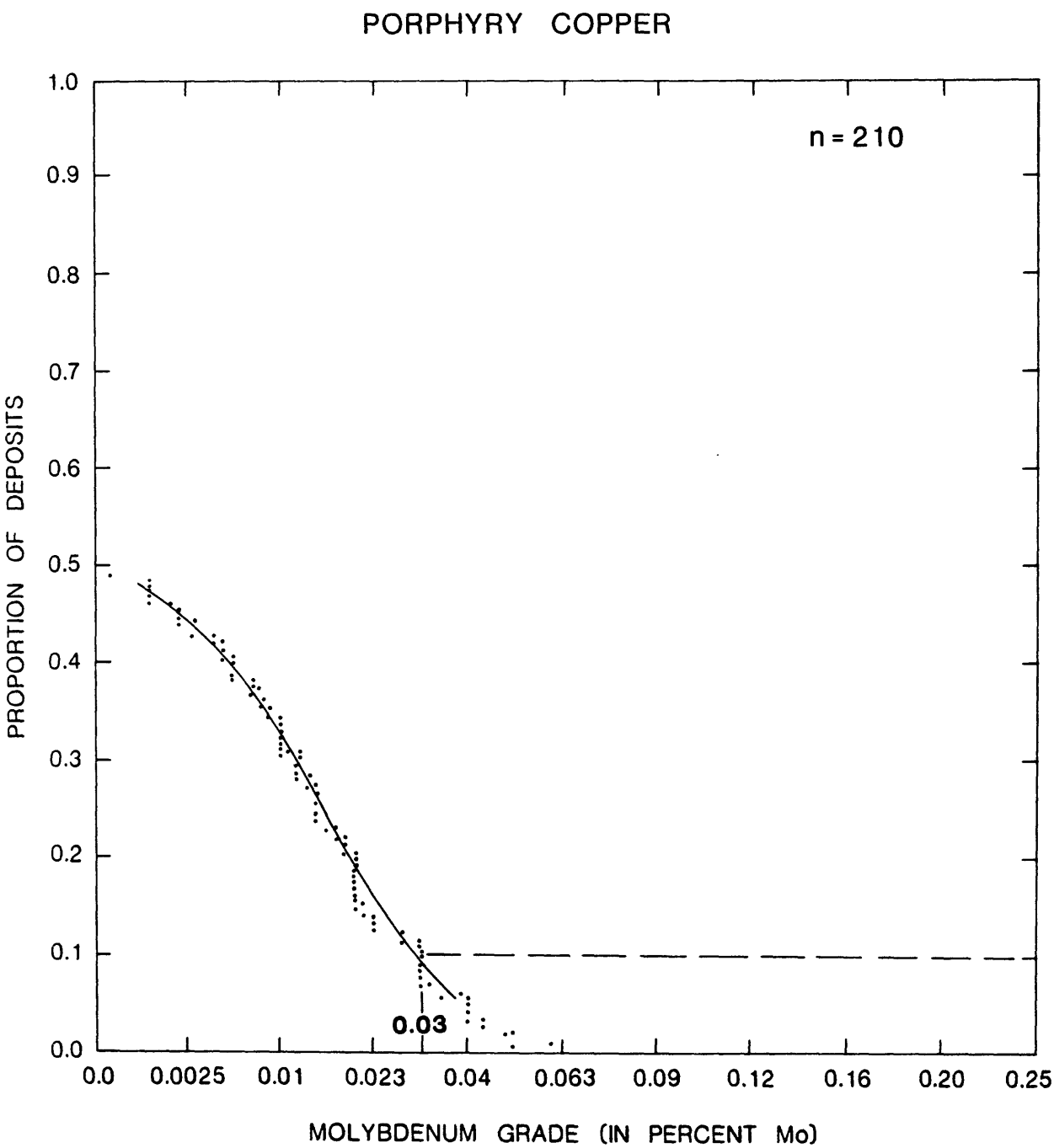
DEPOSIT TYPE Porphyry copper MODEL NUMBER none

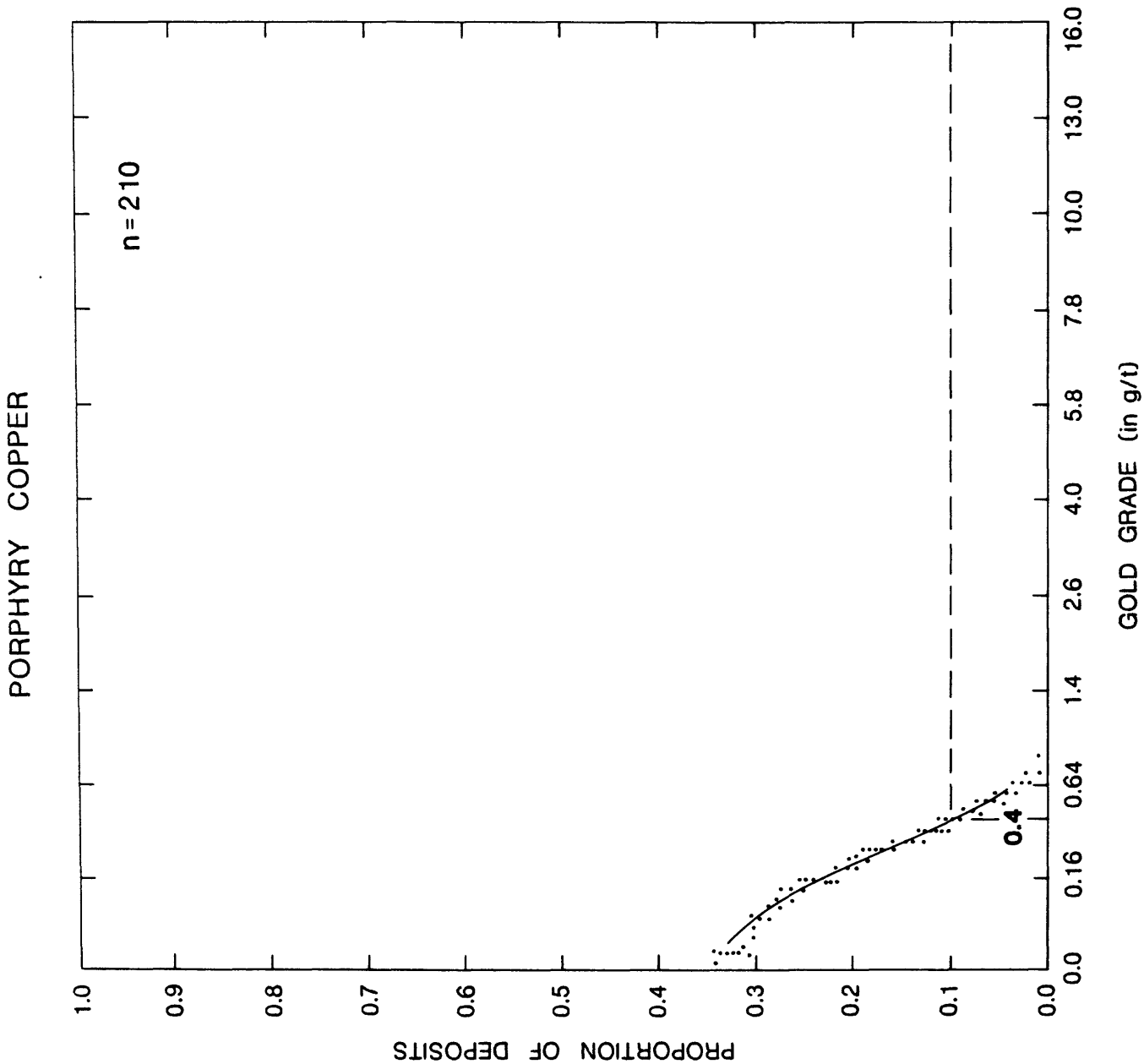
DEPOSITS (continued)

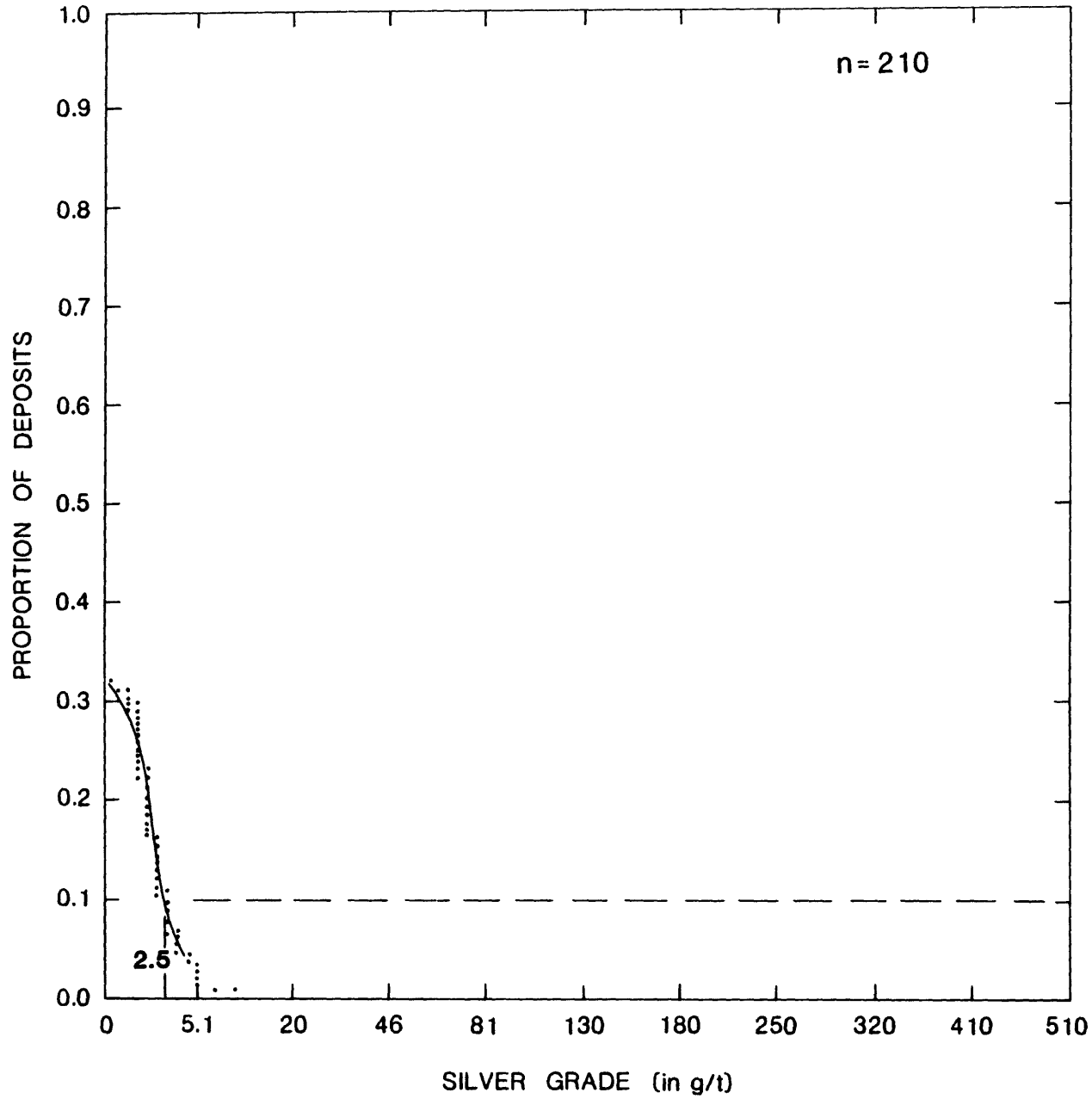
Name	Country	Name	Country	Name	Country
Helvetia	USAZ	Marcopper	PLPN	Rio Vivi	PTRC
Highmont	CNBC	Margaret	USWA	Sacaton (E-W)	USAZ
Hillsborough	USNM	Marian	PLPN	Safford (KCC)	USAZ
Hinobaan	PLPN	Mazama	USWA	Safford (PD)	USAZ
Huckleberry	CNBC	Metcalf	USAZ	Saindak East	PKTN
Ingerbelle	CNBC	Michiquillay	PERU	Saindak North	PKTN
Inguaran	MXCO	Middle Fork	USWA	Saindak South	PKTN
Ino-Capaya	PLPN	Mineral Butte	USAZ	Samar	PLPN
Inspiration	USAZ	Misty	CNBC	San Antonio	PLPN
Iron Mask	CNBC	Mocha	CILE	San Fabian	PLPN
Island Copper	CNBC	Mocoa	CLBA	San Juan	USAZ
Ithica Peak	USAZ	Moniwa	BRMA	San Xavier	USAZ
June	CNBC	Morenci	USAZ	Sanchez	USAZ
Kadzharan	URAM	Morochocha	PERU	Santa Rita	USNM
Kalamaton	PLPN	Morrison	CNBC	Santo Nino	PLPN
Kalamazoo	USAZ	Mountain Mines	PLPN	Santo Tomas	MXCO
Kalmakyr	URUZ	Mount Canninda	AUQL	Santo Tomas	PLPN
Kennon	PLPN	Namosi East	FIJI	Sar Cheshmeh	IRAN
King-King	PLPN	Namosi West	FIJI	Schaft Creek	CNBC
Kirwin	USWY	North Fork	USWA	Sierra Gorda	CILE
Kounrad	URKZ	Ok	CNBC	Silver Bell	USAZ
Krain	CNBC	Ok Tedi	PPNG	Sipalay	PLPN
Kwanika	CNBC	Orange Hill	USAK	Star Mt.-Fubilan	PPNG
La Alumbrera	AGTN	Pampa Norte	CILE	Star Mt.-Futik	PPNG
La Caridad	MXCO	Panguna	PPNG	Star Mt.-Nong River	PPNG
La Florida	MXCO	Paramillos	AGTN	Star Mt.-Olgal	PPNG
La Verde	MXCO	Parks	AUNS	Sugarloaf Hill	CNBC
Lakeshore	USAZ	Pashpap	PERU	Tagpura	PLPN
Lights Creek	USCA	Petaquilla	PANA	Tanama	PTRC
Lornex	CNBC	Philippine	PLPN	Tawi-Tawi	PLPN
Lorraine	CNBC	Pima-Mission	USAZ	Taysan	PLPN
Los Bronces	CILE	Plurhinler	THLD	Toledo	PLPN
Los Pelambres	CILE	Poison Mountain	CNBC	Toquepala	PERU
Los Pilares	MXCO	Potrerillos	CILE	Trojan	CNBC
Lumbay	PLPN	Primer	CNBC	Twin Buttes	USAZ
Luna-Bash	PLPN	Quebrada Blanca	CILE	Tyrone	USNM
MacArthur	USNV	Quelleveco	PERU	Valley Copper	CNBC
Maggie	CNBC	Ray	USAZ	Vekol Copper	USAZ
Majdanpek	YUGO	Recsk	HUNG	Washington	MXCO
Mamut	MDGS	Red Chris	CNBC	Yandera	PPNG
Mantos Blanco	CILE	Red Mountain	USAZ	Yeoval	AUNS
Mapula	PLPN	Rio Blanco	CILE	Yerrington	USNV


PORPHYRY COPPER
n = 210
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
19
140
1100
0.1
0.4
1.6
6.3
25
100
400
1600
6300
25,000
100,000
TONNES (IN MILLIONS)


PORPHYRY COPPER
n = 210
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.032
0.056
0.1
0.18
0.32
0.56
1.0
1.8
3.2
5.6
10.0
0.32
0.5
1.0
COPPER GRADE (IN PERCENT)


PORPHYRY COPPER
n = 210
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.03
0.0
0.0025
0.01
0.023
0.04
0.063
0.09
0.12
0.16
0.20
0.25
MOLYBDENUM GRADE (IN PERCENT Mo)


PORPHYRY COPPER
n = 210
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.16
0.64
1.4
2.6
4.0
5.8
7.8
10.0
13.0
16.0
GOLD GRADE (in g/t)
0.4


PORPHYRY COPPER
n = 210
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2.5
0
5.1
20
46
81
130
180
250
320
410
510
SILVER GRADE (in g/t)

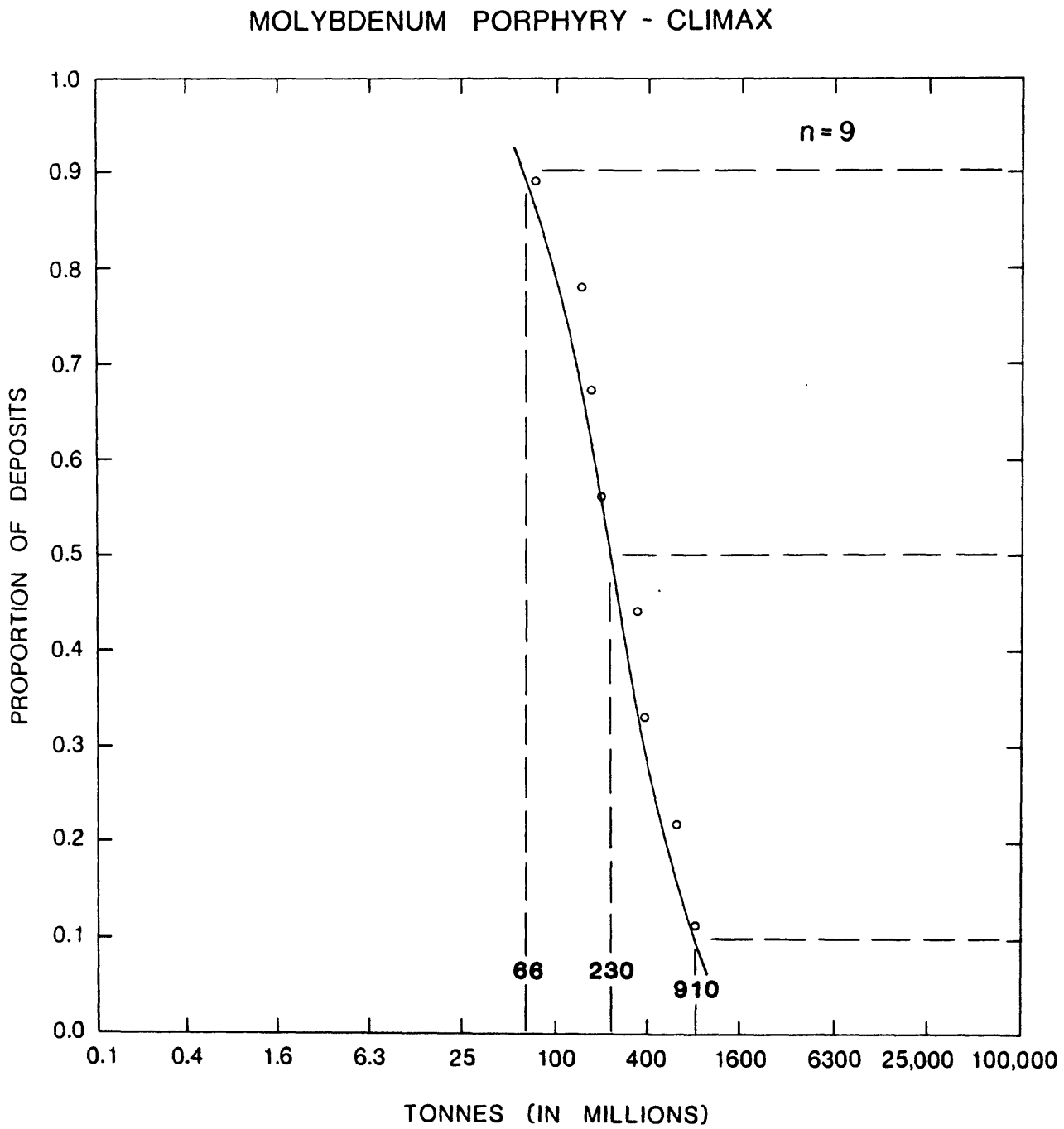
DEPOSIT TYPE Molybdenum porphyry--Climax MODEL NUMBER 2.3

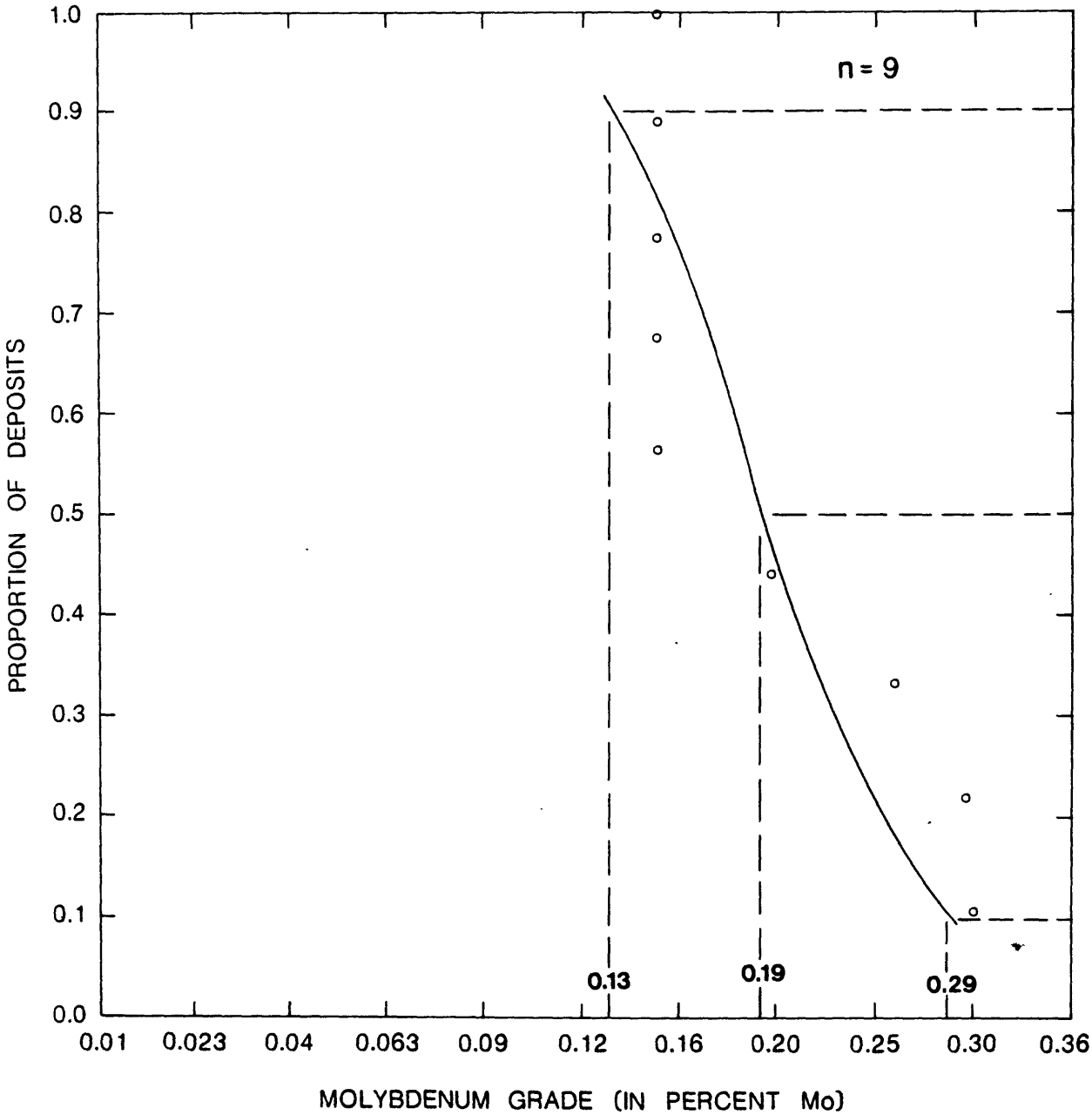
AUTHOR D. A. Singer, T. G. Theodore, and D. L. Mosier

COMMENTS none

DEPOSITS

Name	Country
Big Ben	USMT
Climax	USCO
Henderson	USCO
Malmbjerg	GRLD
Mount Emmons	USCO
Mount Hope	USNV
Pine Grove	USUT
Questa-Goat Hill	USNM
Redwell	USCO


MOLYBDENUM PORPHYRY - CLIMAX
n = 9
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
66
230
910
0.1
0.4
1.6
6.3
25
100
400
1600
6300
25,000
100,000
TONNES (IN MILLIONS)


MOLYBDENUM PORPHYRY - CLIMAX
n = 9
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.13
0.19
0.29
0.01
0.023
0.04
0.063
0.09
0.12
0.16
0.20
0.25
0.30
0.36
MOLYBDENUM GRADE (IN PERCENT Mo)

DEPOSIT TYPE Molybdenum porphyry (low F type) MODEL NUMBER 2.4

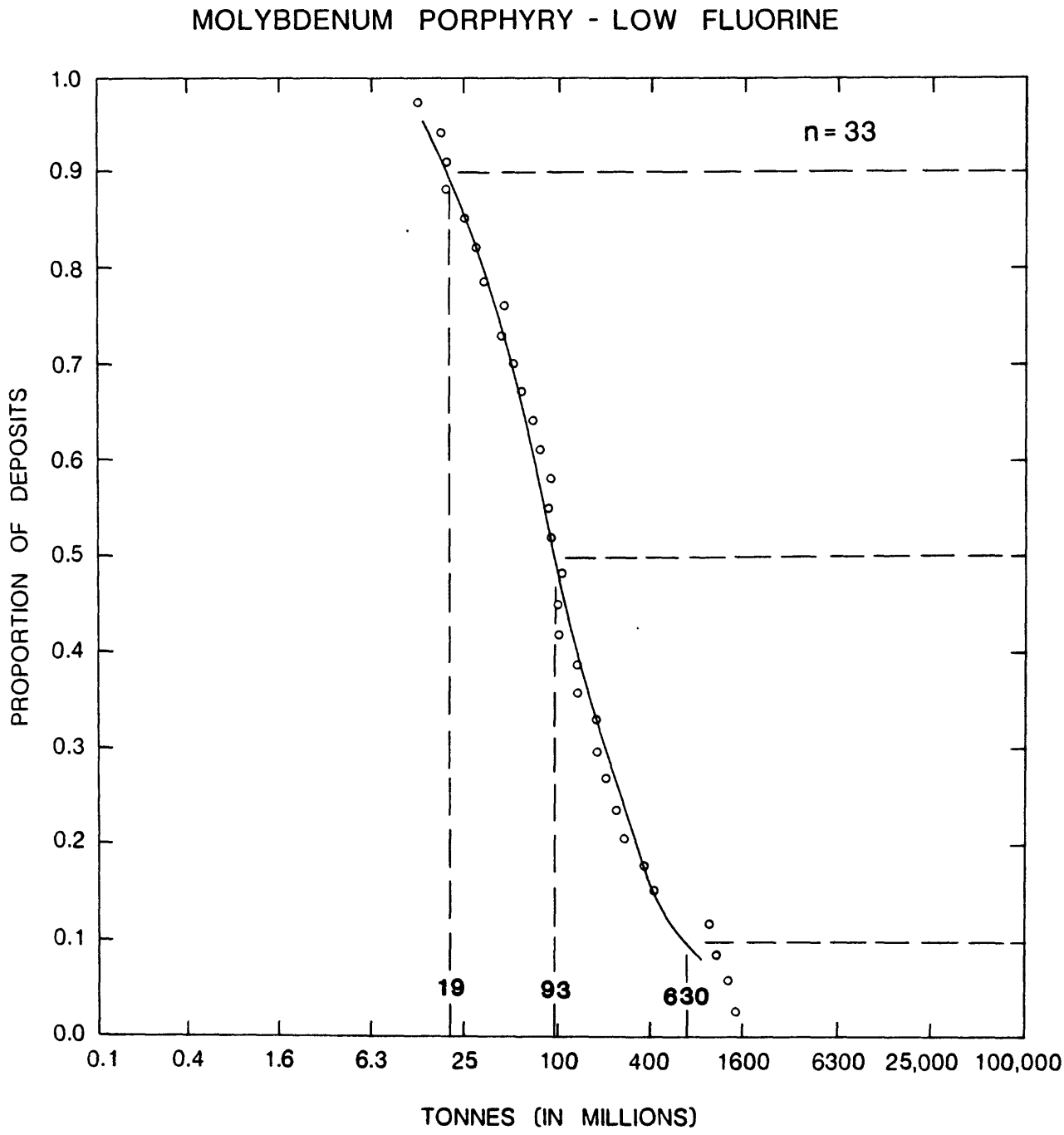
AUTHOR W. D. Menzie and T. G. Theodore

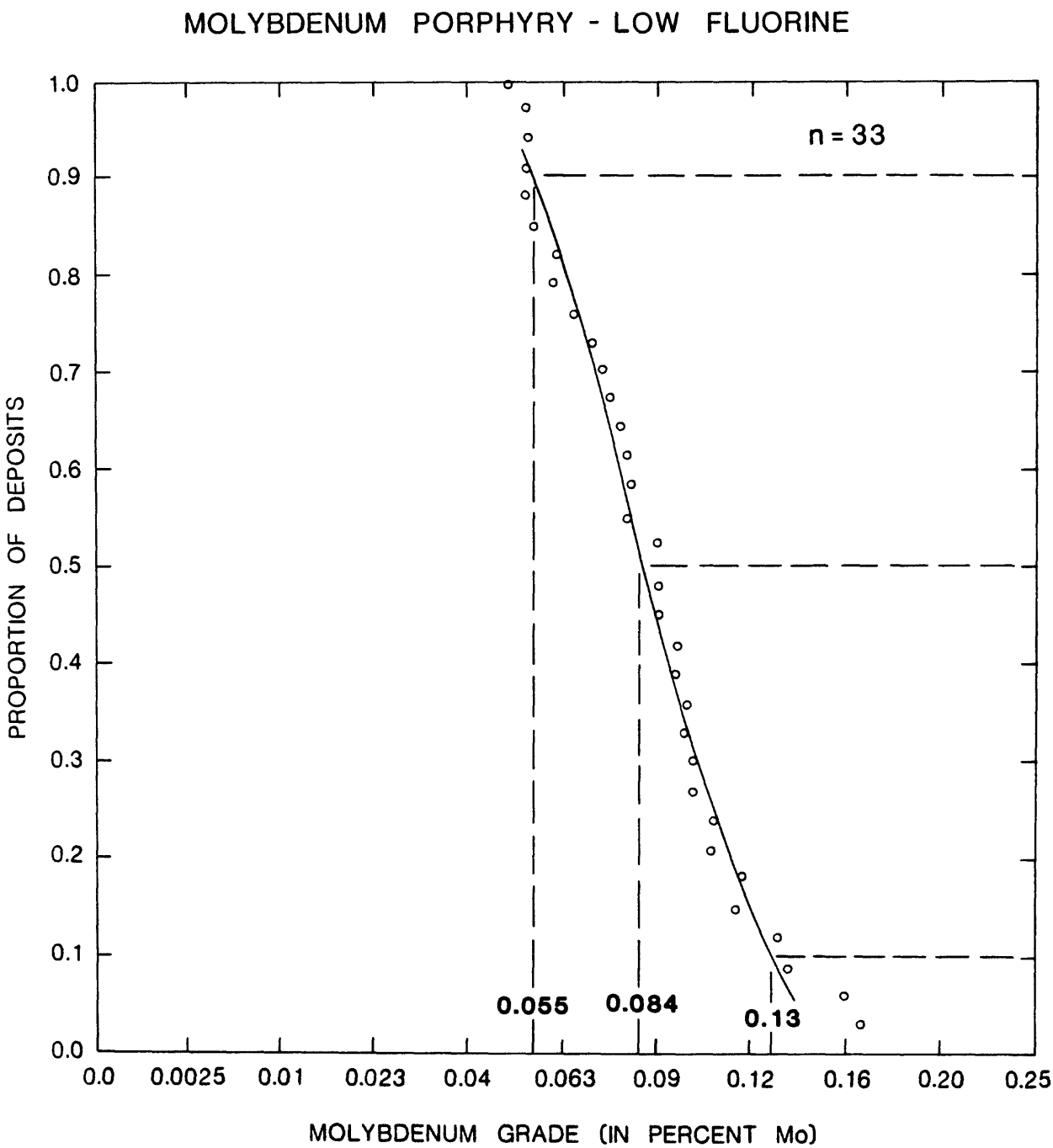
DATA REFERENCES Theodore and Menzie, 1983.

COMMENTS none

DEPOSITS

Name	Country
Anduramba	AUQL
Adanac (Ruby Creek)	CNBC
Ajax (Dak River)	CNBC
B. C. Moly	CNBC
Bell Molybdenum	CNBC
Boss Mountain	CNBC
Boswell River	CNYT
Buckingham	USNV
Cannivan Gulch	USMT
Carmi	CNBC
Creston	MXCO
Endako	CNBC
Gem	CNBC
Glacier Gulch	CNBC
Hall	USNV
Haskin Mountain	CNBC
Karen	CNBC
Lucky Ship	CNBC
Machkatica	YUGO
Mount Thomlinson	CNBC
Mount Tolman	USWA
Pine Nut	USNV
Pitman (JB)	CNBC
Quartz Hill	USAK
Red Bird	CNBC
Red Mountain	CNYT
Serb Creek	CNBC
Setting Net Lake	CNON
Storie	CNBC
Sunshine Creek	CNBC
Thompson Creek	USID
Trout Lake	CNBC
UV Industries	USNV


MOLYBDENUM PORPHYRY - LOW FLUORINE
n = 33
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
19
93
630
0.1
0.4
1.6
6.3
25
100
400
1600
6300
25,000
100,000
TONNES (IN MILLIONS)


MOLYBDENUM PORPHYRY - LOW FLUORINE
n = 33
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.055
0.084
0.13
0.0
0.0025
0.01
0.023
0.04
0.063
0.09
0.12
0.16
0.20
0.25
MOLYBDENUM GRADE (IN PERCENT Mo)

DEPOSIT TYPE Iron skarn MODEL NUMBER 2.5

AUTHOR D. L. Mosier and W. D. Menzie

COMMENTS Some of the data represent districts.

DEPOSITS

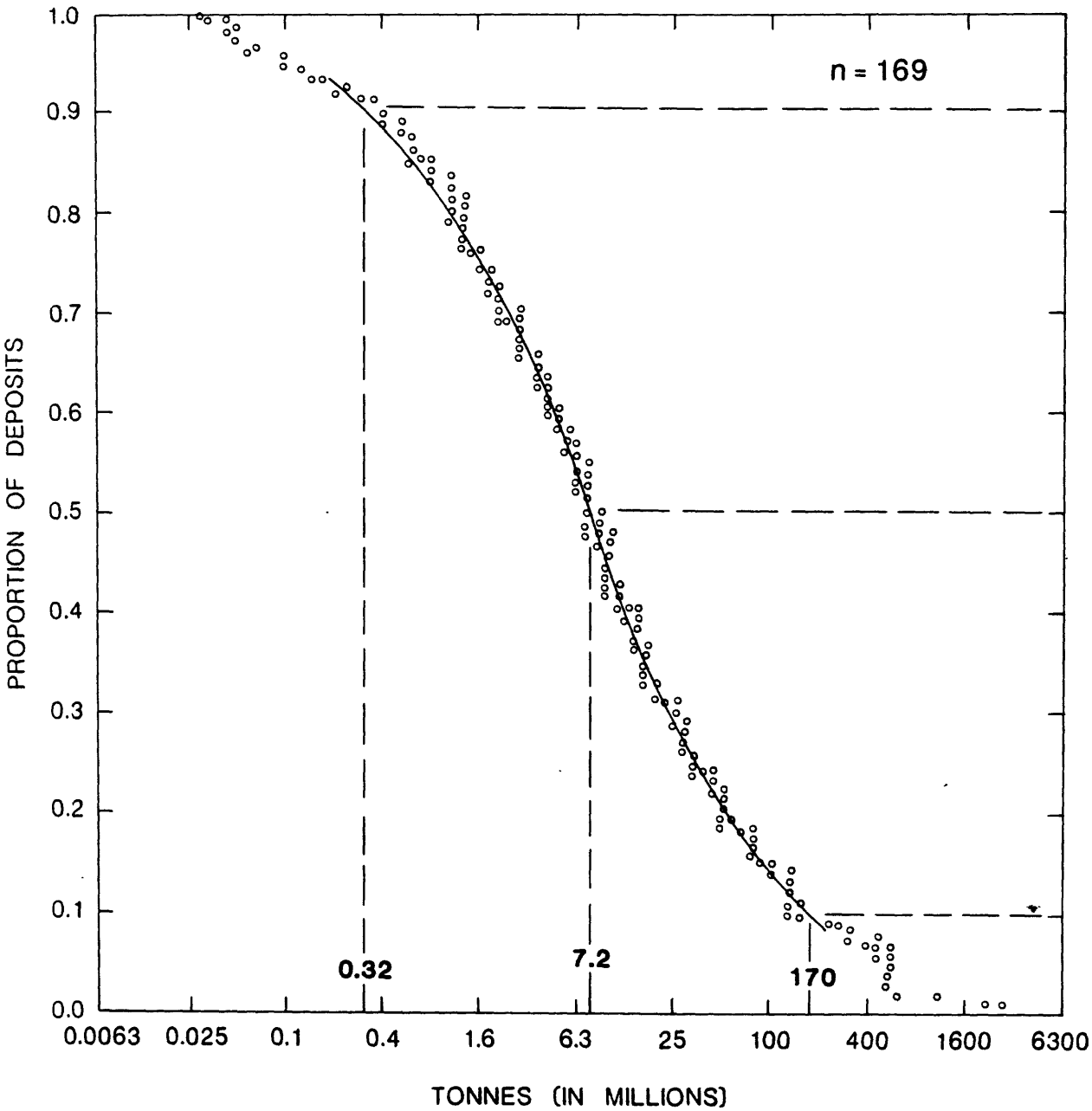
Name	Country	Name	Country
Adaevka central	URUR	Daiquiri	CUBA
Adaevka north	URUR	Dammer Nissar	PKTN
Adaevka south	URUR	Dannemora	SWDN
Agalteca	HNDR	Dayton	USNV
Ain Mokra	ALGR	Divrigi	TRKY
Ain Oudrer	ALGR	Dungun	MDGS
Akatani	JAPN	Dzama	URUR
Alagada	PORT	Eagle Mountain	USCA
Aleshinka	URUR	El Pedroso	SPAN
Argonaut	CNBC	El Sol y La Luna	MXCO
Asvan	TRKY	El Volcan-Piedra Iman	MXCO
Auerbach	URUR	Eltay	URUR
Ayazmant	TRKY	Estyunin	URUR
Baghain	IRAN	Fierro-Hannover	USNM
Baisoara	RMNA	Gallinas	USNM
Beck	USCA	Giresun	TRKY
Beni Douala	ALGR	Gora Magnitnaya	URUR
Benkala	URUR	Gora Vysokaya	URUR
Bessermer	CNON	Hatillo	DMRP
Bizmisen-Akusagi	TRKY	Hercules	MXCO
Blairton	CNON	Hierro Indio	AGTN
Bolsherechensk	URUR	Huacravilca	PERU
Bulacan	PLPN	Hualpai	CNBC
Brynor	CNBC	Huancabamba	PERU
Calabogie	CNON	Hull	CNQU
Camiglia	ITLY	Imanccasa	PERU
Capacmarca	PERU	Ino	JAPN
Capitan	USNM	Iron Duke	CNBC
Carmen	CILE	Iron Hat	USCA
Cave Canyon	USCA	Iron Mike	CNBC
Cehegin	SPAN	Iron Mountain (Colfax Co.)	USNM
Chichibu	JAPN	Iron Mountain (Sierra Co.)	USNM
Childs Mine	CNON	Iron Springs	USUT
Colquemarca	PERU	Jedway	CNBC
Copper Flat	USNM	Jerez de los Caballeros	SPAN
Cuchillo-Negro	USNM	Jib	CNBC

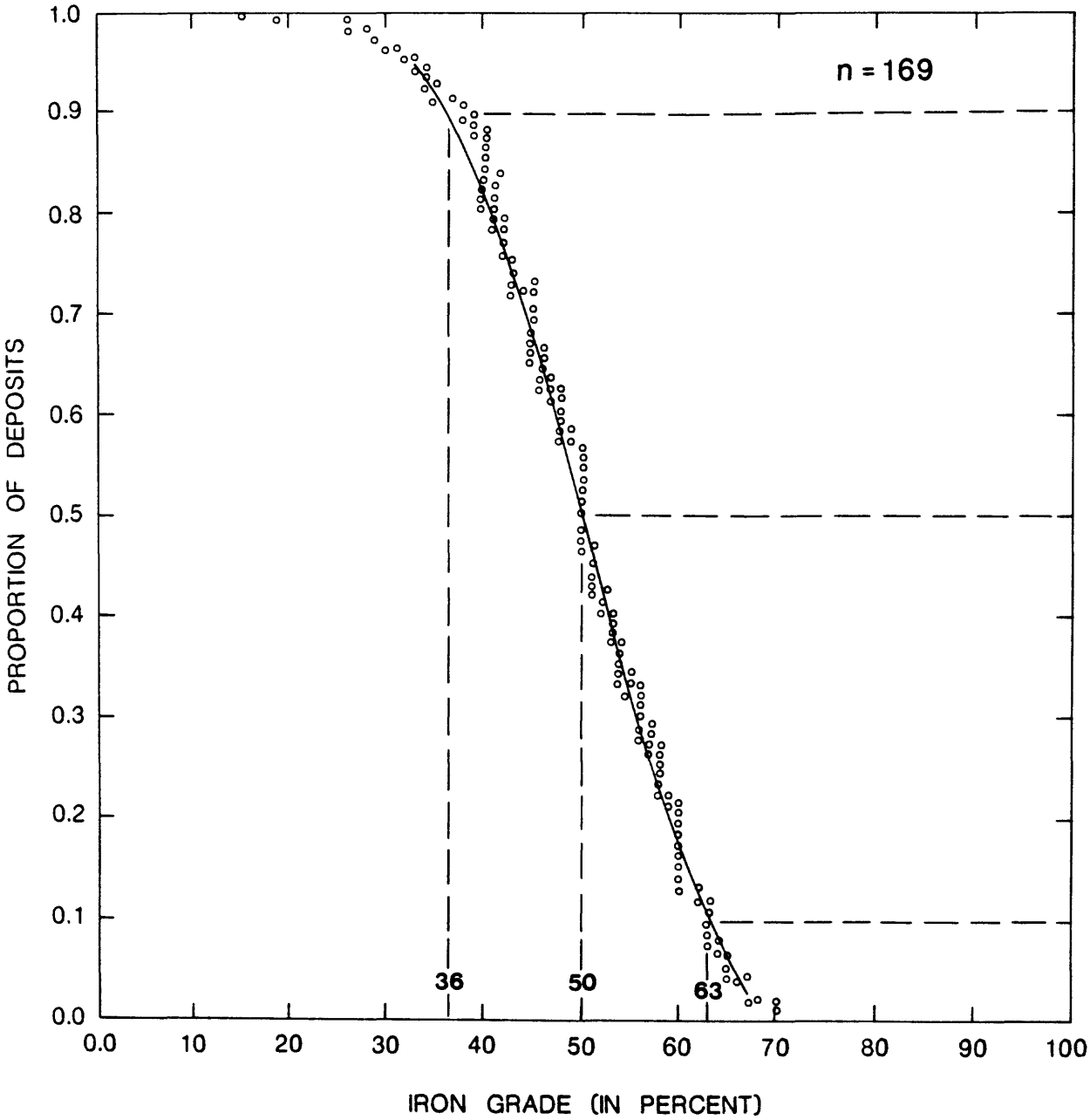
(continued on next page)

DEPOSIT TYPE Iron skarn MODEL NUMBER 2.5

DEPOSITS (continued)

Name	Country	Name	Country	Name	Country
Jicarilla	USNM	Mogpog	PLPN	Santa Lucia	PERU
Jones Camp	USNM	Monte Carmelo	NCRG	Santa Rita	USNM
Juncos	CNBC	Munesada	JAPN	Sarbay	URUR
Kachar	URUR	Nimpkish	CNBC	Senor de Huarquisa	PERU
Kalkan	TRKY	Novo Maslovo	URUR	Severnoe I	URUR
Kambaikhin central	URUR	Novo Peschansk	URUR	Severnoe II	URUR
Kambaikhin east	URUR	Ocna de Fier	RMNA	Severnoe III	URUR
Kambaikhin north	URUR	Old Dad Mountains	USCA	Shagyrkul	URUR
Karamadazi	TRKY	Orogrande	USNM	Shasta-California	USCA
Kaunisvaara-Masugnsbyn	SWDN	Osokino-Aleksandrovsk	URUR	Shinyama	JAPN
Kesikkopru	TRKY	Pambuhan Sur	PLPN	Silver Lakes	USCA
Kozyrevka	URUR	Pampachiri	PERU	Sorka	URUR
Kroumovo	URUR	Paracale	PLPN	Sosva	URUR
Kruglogorsk	URUR	Pena Colorada	MXCO	South Sarbay	URUR
Kurzhunkul	URUR	Perda Niedda	ITLY	Takanokura	JAPN
La Carmen	MXCO	Persberg	SWDN	Tapairihua	PERU
La Laguna	DMRP	Peschansk	URUR	Techa	URUR
La Paloma	MXCO	Picila	MXCO	Tecolote	USNM
La Piedra Iman	MXCO	Piddig	PLPN	Tepustete	MXCO
Las Animas Cerro Prieto	MXCO	Plagia	GREC	Texada	CNBC
Las Truchas	MXCO	Pokrovsk	URUR	Tovarnica	YUGO
Larap-Calambayungan	PLPN	Rankin	CNON	Tsaitsukou	CINA
Lava Bed	USCA	Recibimiento	MXCO	Val Di Peio	ITLY
Lebyazhka	URUR	Rondoni	PERU	Valuev	URUR
Livitaca-Velille	PERU	Rose	CNBC	Vorontsovka	URUR
Lomonosov	URUR	Rudna Glava	YUGO	Vulcan	USCA
Maanshan	HONG	Sabana Grande	DMRP	Vyhne	CZCL
Mac	CNBC	Samli	TRKY	Wagasennin	JAPN
Marbella	SPAN	San Carlos	MXCO	Yellow Jacket	USNM
Marmoraton	CNON	San Juan de Chacna	PERU	Zanitza	MXCO
Martinovo	BULG	San Leone	ITLY	Zarikan	IRAN
Maslovo	URUR	Sankyo	JAPN	Zeballos	CNBC
Mati	PLPN				


IRON SKARN
n = 169
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.32
7.2
170
0.0063
0.025
0.1
0.4
1.6
6.3
25
100
400
1600
6300
TONNES (IN MILLIONS)


IRON SKARN
n = 169
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
10
20
30
40
50
60
70
80
90
100
36
50
63
IRON GRADE (IN PERCENT)

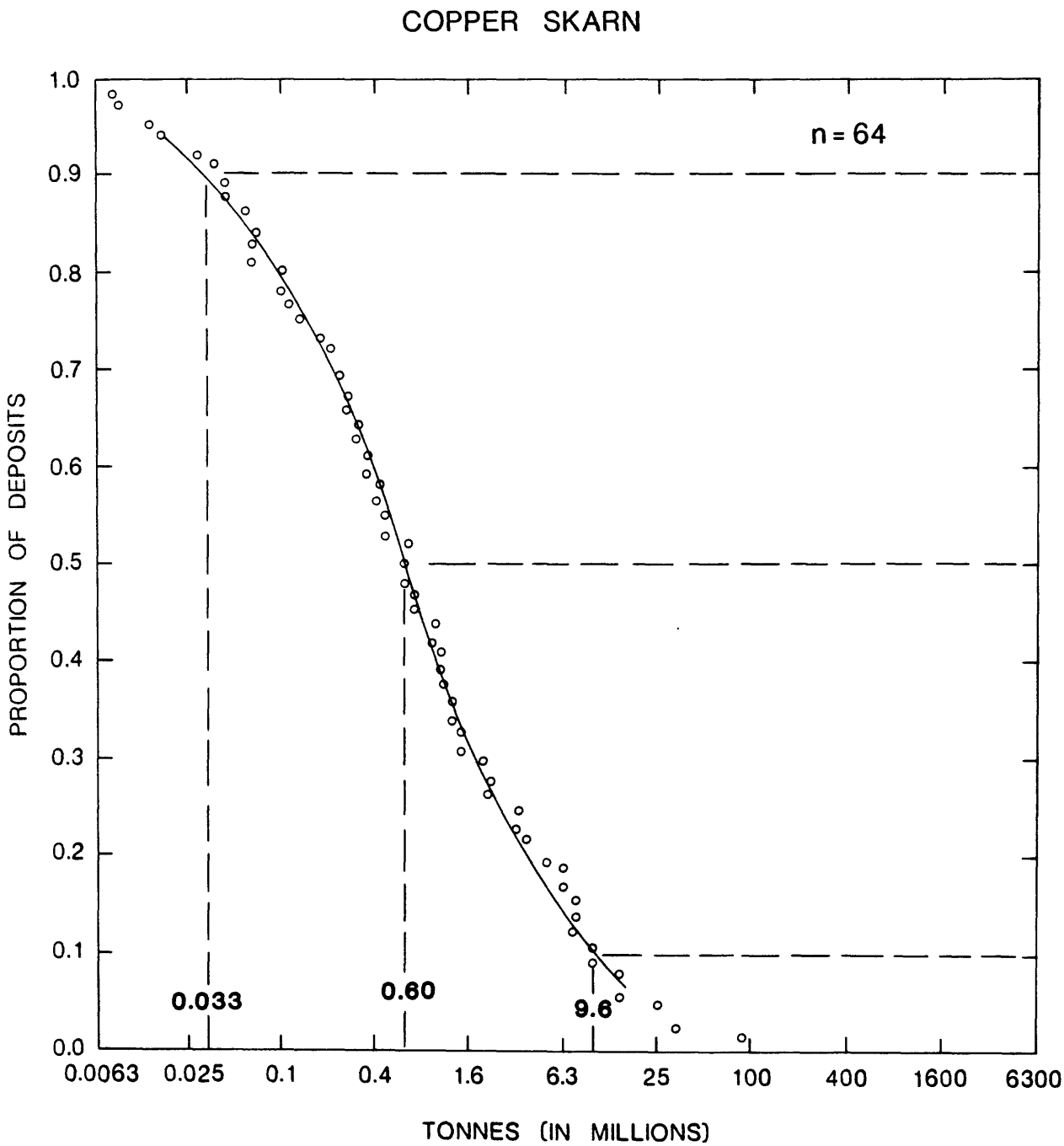
DEPOSIT TYPE Copper skarn MODEL NUMBER 2.6

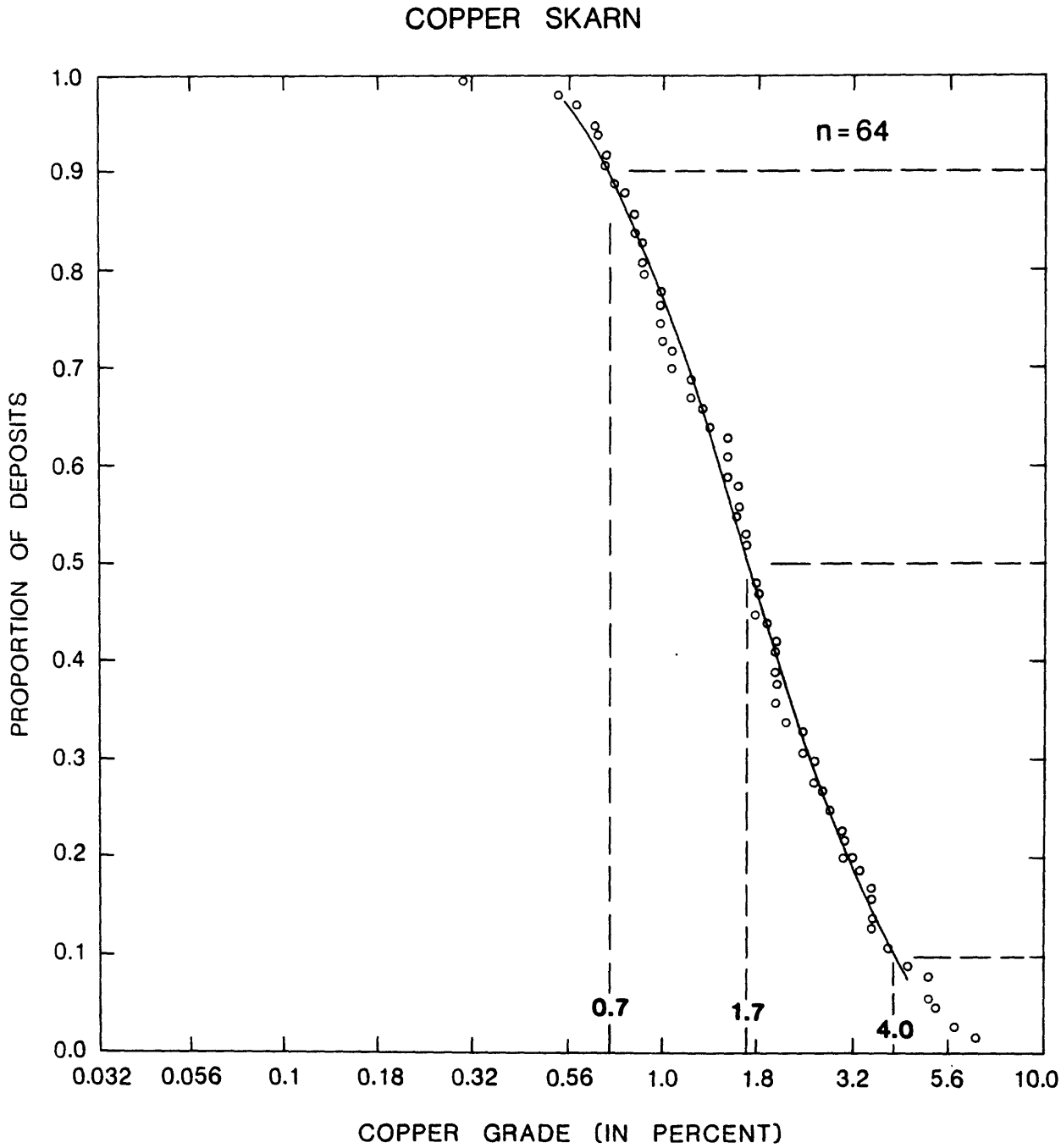
AUTHOR G. M. Jones and W. D. Menzie

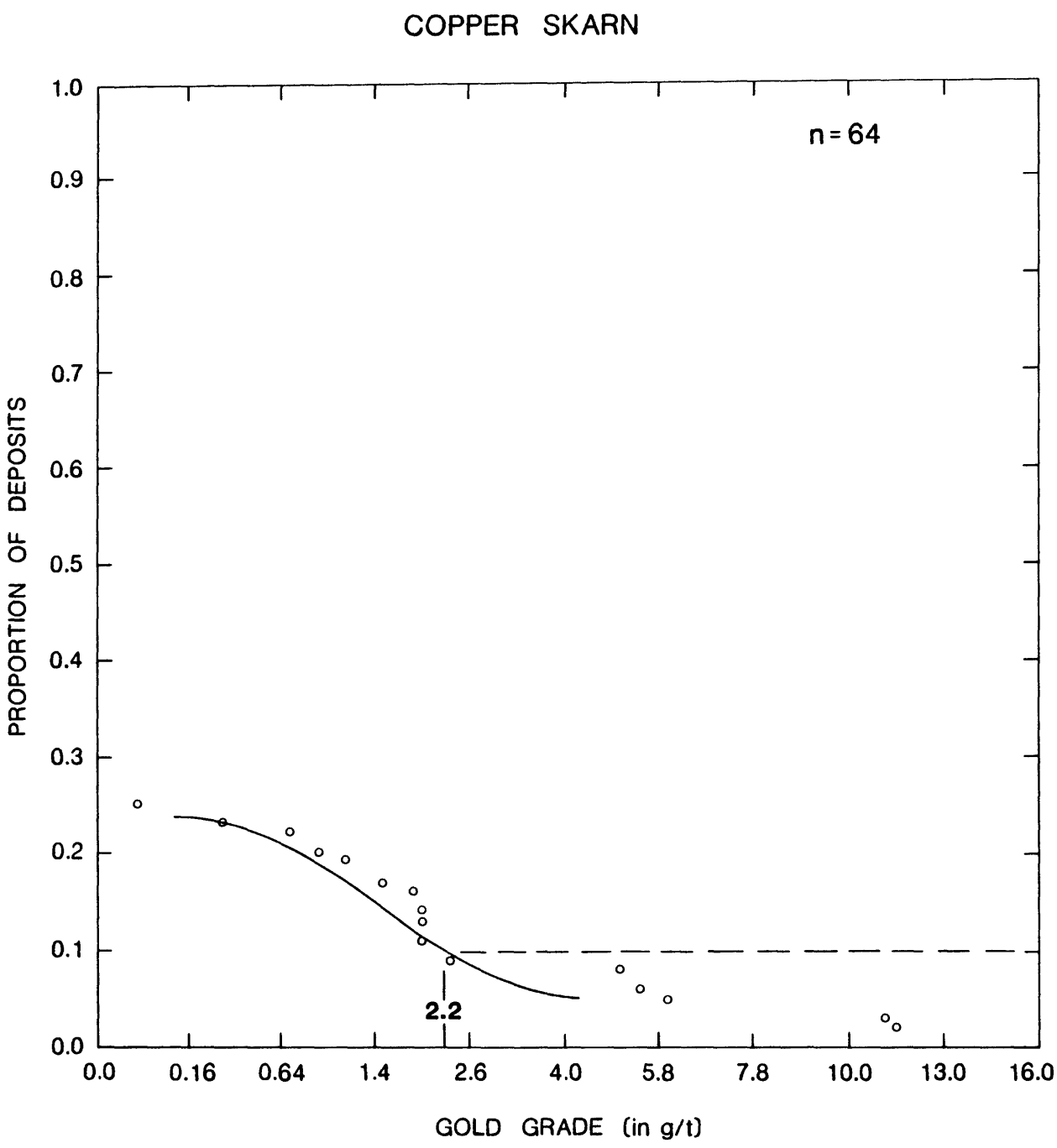
COMMENTS Data used in this model were restricted to copper skarns associated with barren stocks as recommended by Einaudi and others (1981). Some of the data are from districts. At the five percent level there is a negative correlation between tonnage and copper grade ($r = -0.30$).

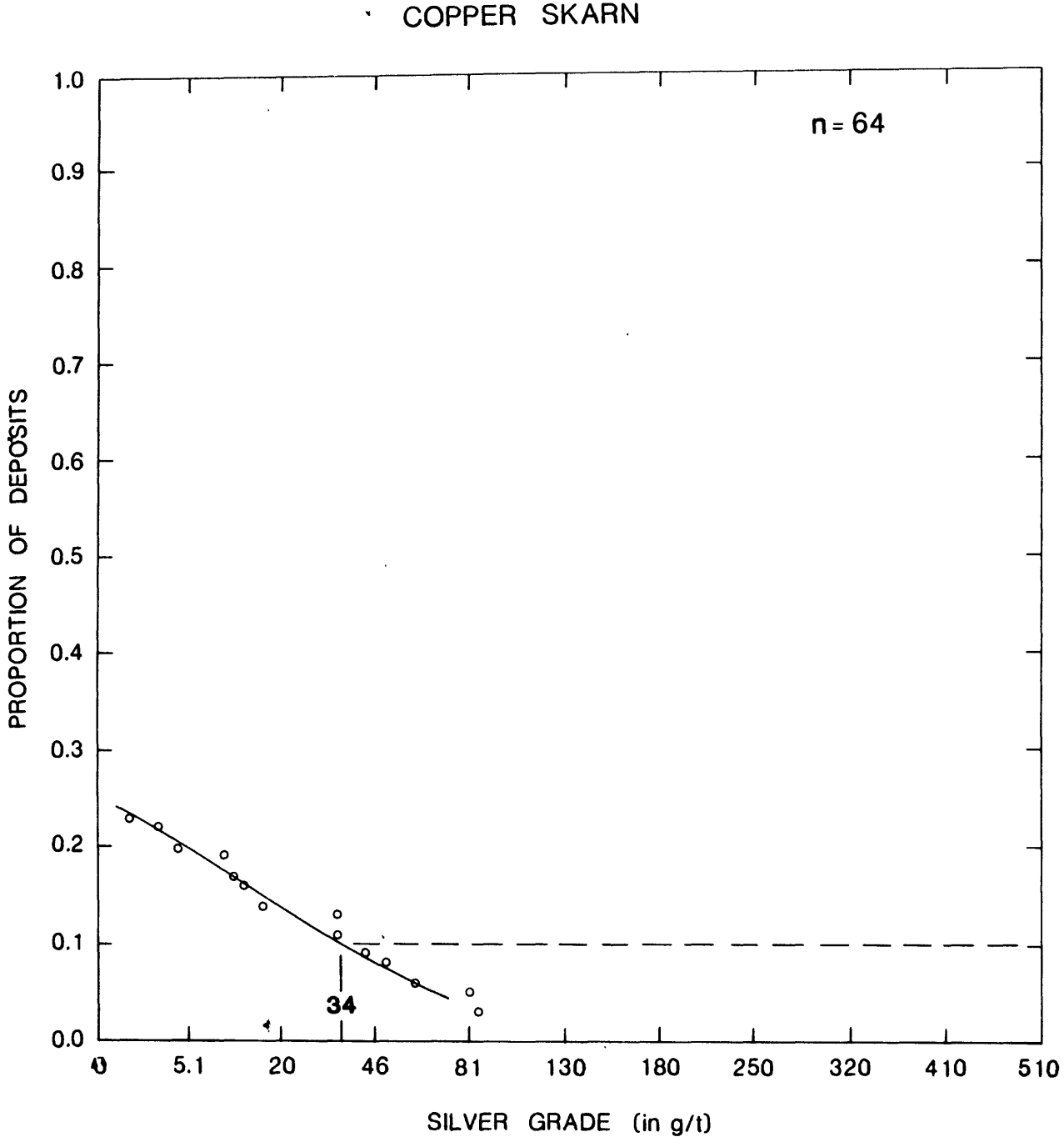
DEPOSITS

Name	Country	Name	Country
Agordo-Brosso	ITLY	Loei-Chiengkarn	THLD
Arctic Chief	CNYT	Ludwig	USNV
B. C.	CNBC	Mackey	USID
Benson Lake	CNBC	Malko Trnova	BULG
Best Chance	CNYT	Marble Bay	CNBC
Black Cub	CNYT	Mason Valley-Malachite	USNV
Blue Grouse	CNBC	McConnell	USNV
Bluestone	USNV	Meme Zone	HATI
Caledonia	CNBC	Mina El Sapo	CLBA
Cassius	HATI	Mina Vieja	CLBA
Casting	USNV	Mother Lode-Sunset	CNBC
Cerro de Cobre	CLBA	Obira	JAPN
Chalcobamba	PERU	Oregon	CNBC
Coast Copper	CNBC	Oro Denoro (Ema)	CNBC
Cobriza	PERU	Phoenix	CNBC
Concepcion Del Oro	MXCO	Queen Victoria (Swift)	CNBC
Copper Queen	CNBC	Rosita	NCRG
Cornell	CNBC	San Pedro	USNM
Cowley Creek	CNYT	Sasca Montana	RMNA
Douglas Hill	USNV	Sasagatani	JAPN
Gem	CNYT	Snowshoe	USNM
Hiragane	JAPN	Strandzha	BULG
Hope	CNBC	Tasu-Wesfrob	CNBC
Iide	JAPN	Tintaya	PERU
Indian Chief	CNBC	Traversella	ITLY
Kamaishi	JAPN	Tsumo	JAPN
Kedbeg Copper	URUR	Vananda	CNBC
Keewenaw	CNYT	War Eagle	CNYT
Kodiak Cub	CNYT	Western Nevada	USNV
Lily (Ikeno)	CNBC	Wexford	CNBC
Little Chief	CNYT	Yreka	CNBC
Lucky Four	CNBC	Zip	CNBC


COPPER SKARN
n = 64
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.033
0.60
9.6
0.0063
0.025
0.1
0.4
1.6
6.3
25
100
400
1600
6300
TONNES (IN MILLIONS)


COPPER SKARN
n = 64
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.7
1.7
4.0
0.032
0.056
0.1
0.18
0.32
0.56
1.0
1.8
3.2
5.6
10.0
COPPER GRADE (IN PERCENT)


COPPER SKARN
n = 64
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2.2
0.0
0.16
0.64
1.4
2.6
4.0
5.8
7.8
10.0
13.0
16.0
GOLD GRADE (in g/t)


COPPER SKARN
n = 64
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
34
0
5.1
20
46
81
130
180
250
320
410
510
SILVER GRADE (in g/t)

DEPOSIT TYPE Copper skarn--porphyry copper MODEL NUMBER none

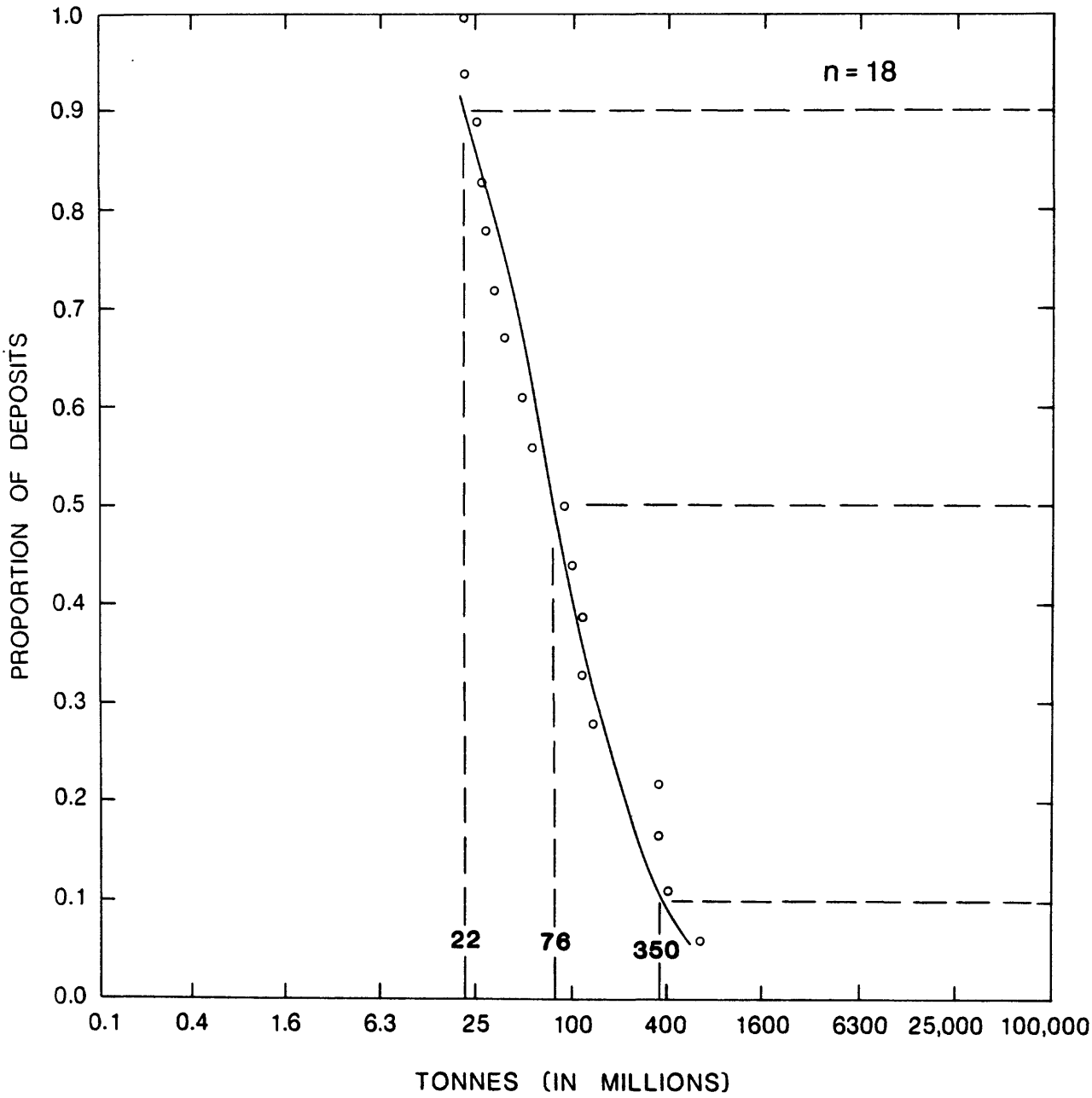
AUTHOR D. A. Singer

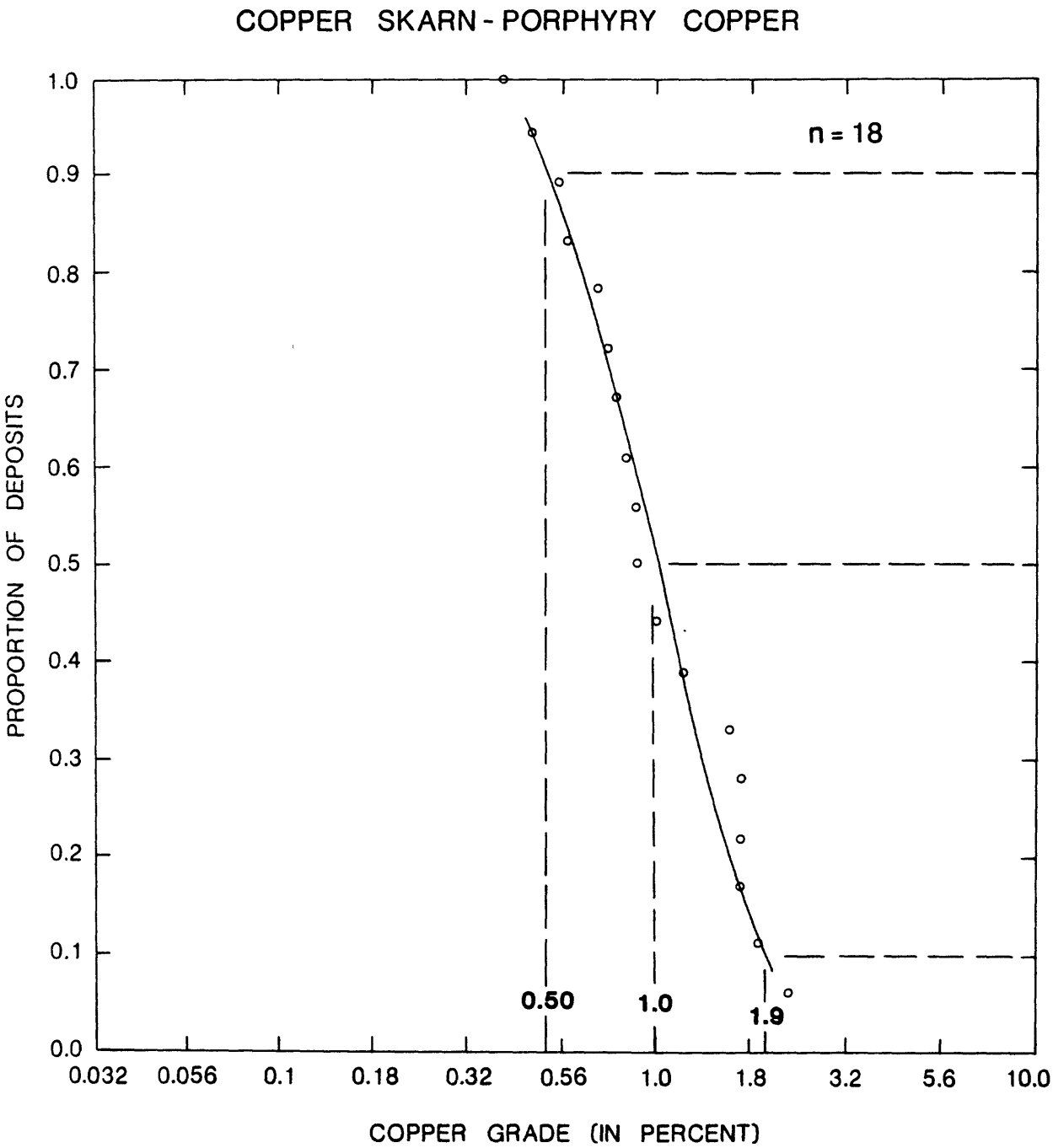
DATA REFERENCES Einaudi and others, 1981; Einaudi, 1981.

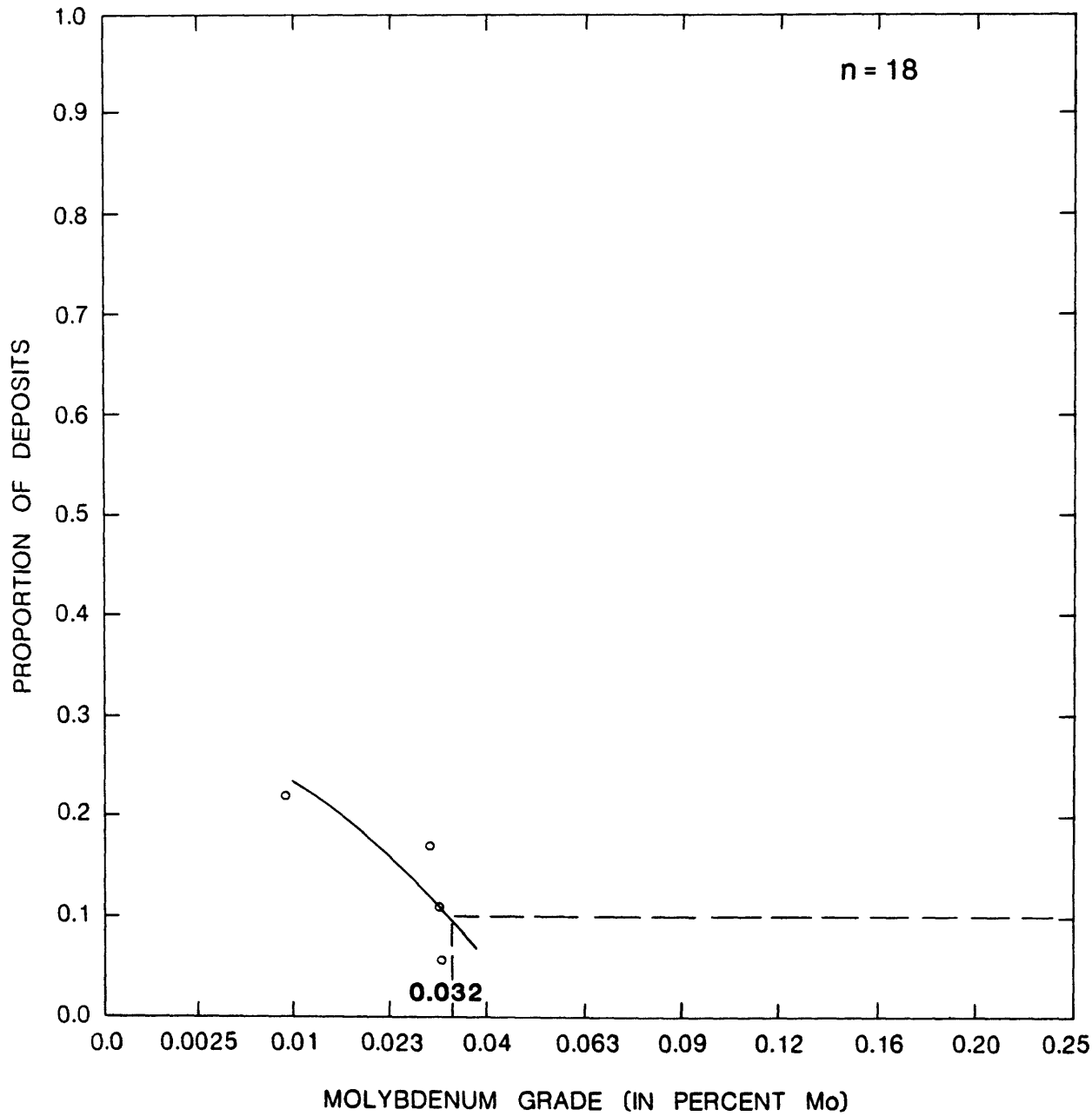
COMMENTS Skarn copper deposits associated with porphyry copper deposits are included in this model. Tonnages and grades attributable to skarn were estimated for some deposits from estimated proportions of skarn provided by Einaudi and others (1981) and Einaudi (1981).

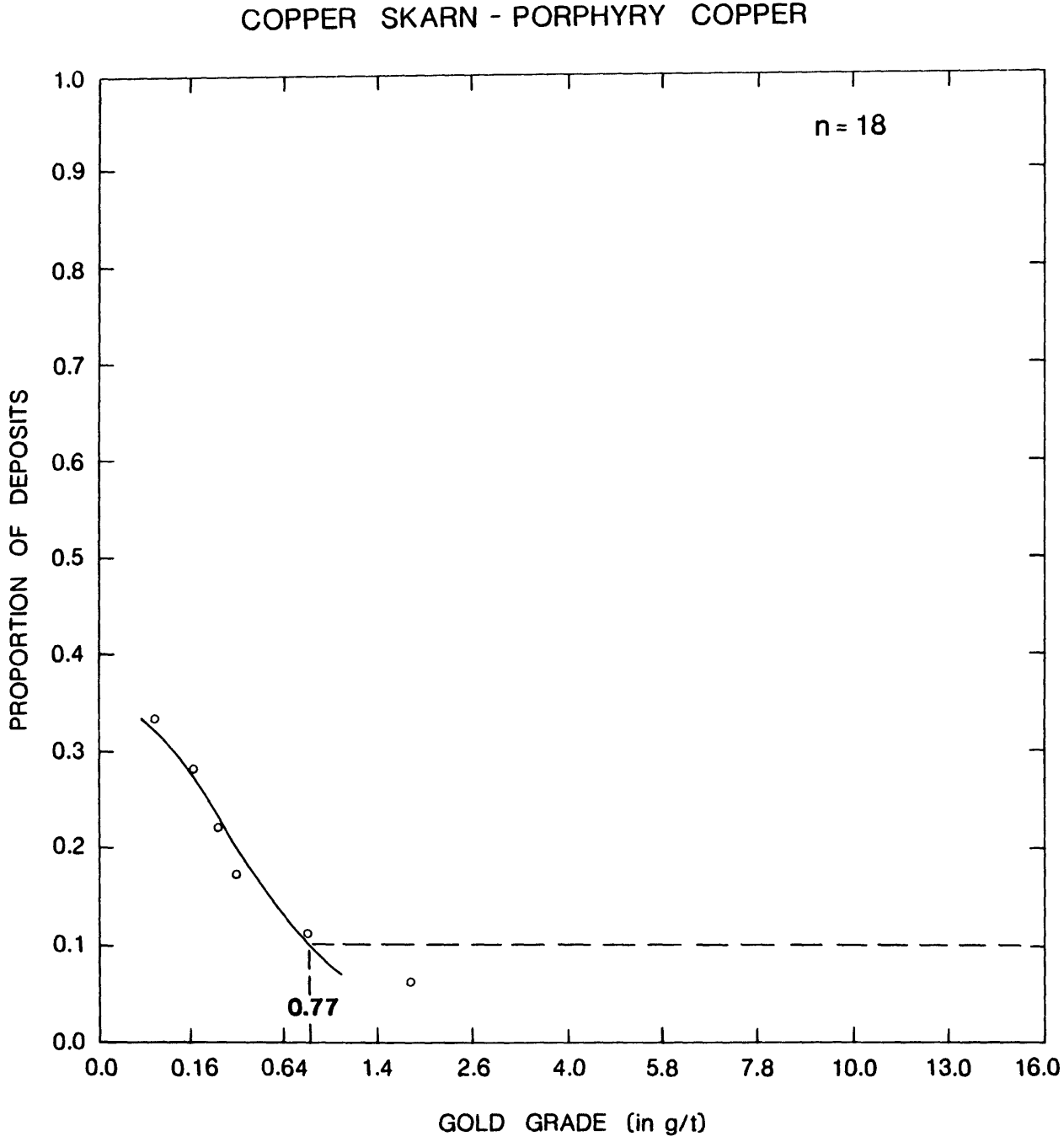
DEPOSITS

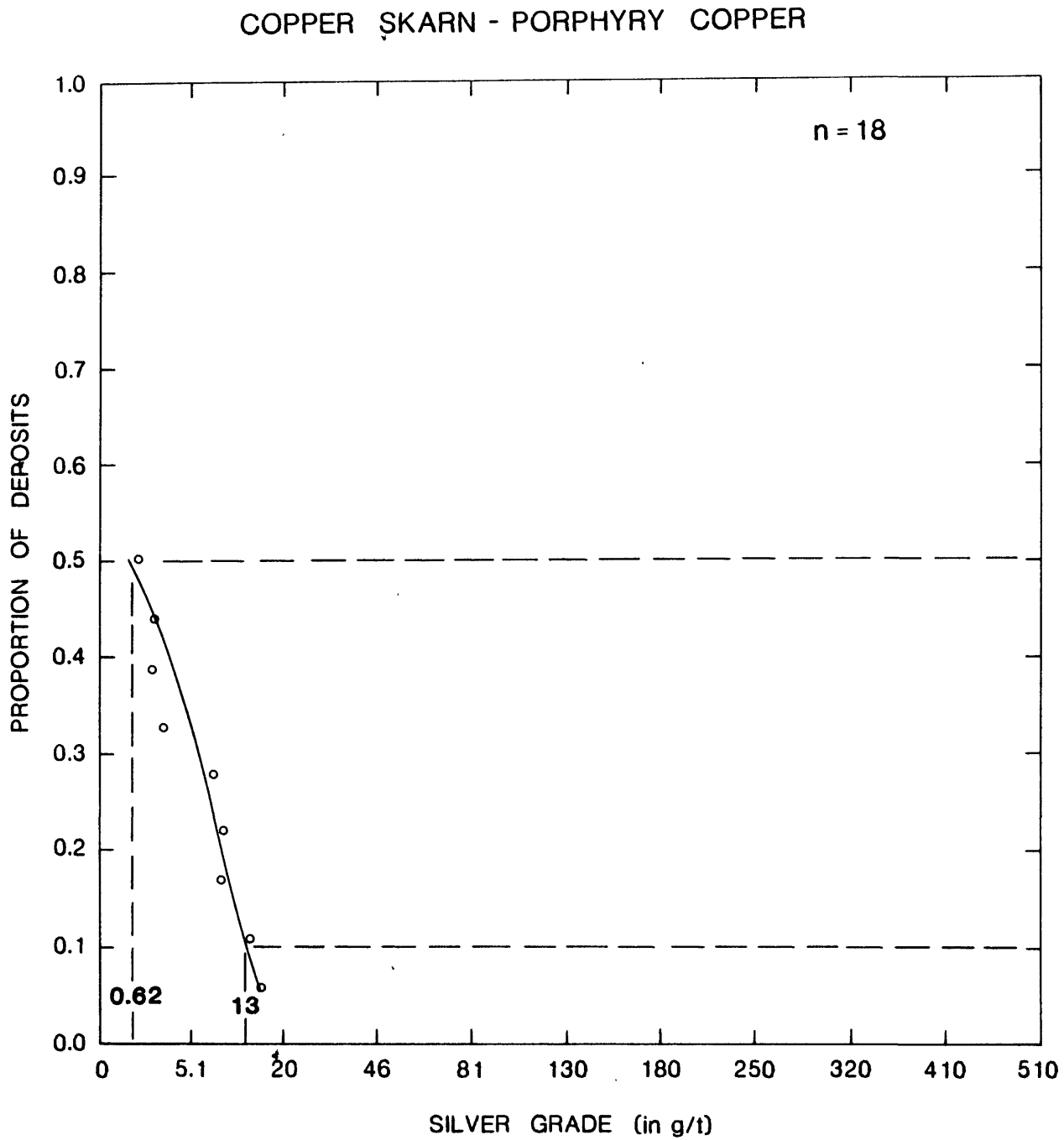
Name	Country
Cananea (Cepote)	MXCO
Carr Fork	USUT
Christmas	USNM
Continental	USNM
Copper Basin	USNV
Copper Canyon	USNV
Craigmont	CNBC
Ely	USNV
Gaspe (Needle Mountain)	CNQU
Gold Coast	PPNG
Lakeshore	USAZ
Lyon	USNV
Pima-Mission	USAZ
Potrerillos	CILE
Recsk	HUNG
Santa Rita	USNM
Silver Bell	USAZ
Twin Buttes	USAZ


COPPER SKARN - PORPHYRY COPPER
n = 18
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
22
76
350
0.1
0.4
1.6
6.3
25
100
400
1600
6300
25,000
100,000
TONNES (IN MILLIONS)


COPPER SKARN - PORPHYRY COPPER
n = 18
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.50
1.0
1.9
0.032
0.056
0.1
0.18
0.32
0.56
1.0
1.8
3.2
5.6
10.0
COPPER GRADE (IN PERCENT)


COPPER SKARN - PORPHYRY COPPER
n = 18
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.032
0.0
0.0025
0.01
0.023
0.04
0.063
0.09
0.12
0.16
0.20
0.25
MOLYBDENUM GRADE (IN PERCENT Mo)


COPPER SKARN - PORPHYRY COPPER
n = 18
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.77
0.0
0.16
0.64
1.4
2.6
4.0
5.8
7.8
10.0
13.0
16.0
GOLD GRADE (in g/t)


COPPER SKARN - PORPHYRY COPPER
n = 18
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.62
13
0
5.1
20
46
81
130
180
250
320
410
510
SILVER GRADE (in g/t)

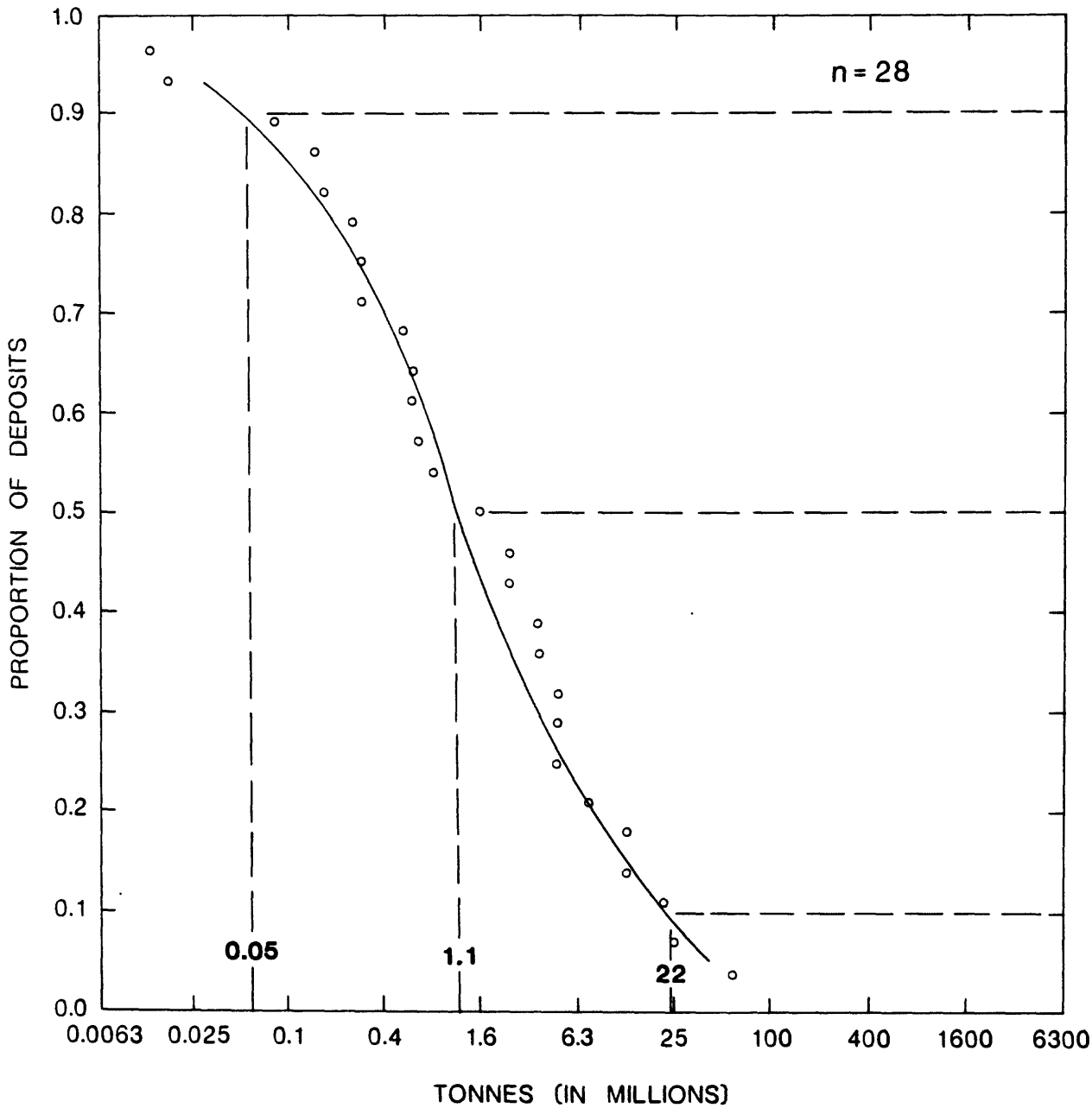
DEPOSIT TYPE Tungsten skarn MODEL NUMBER 2.8

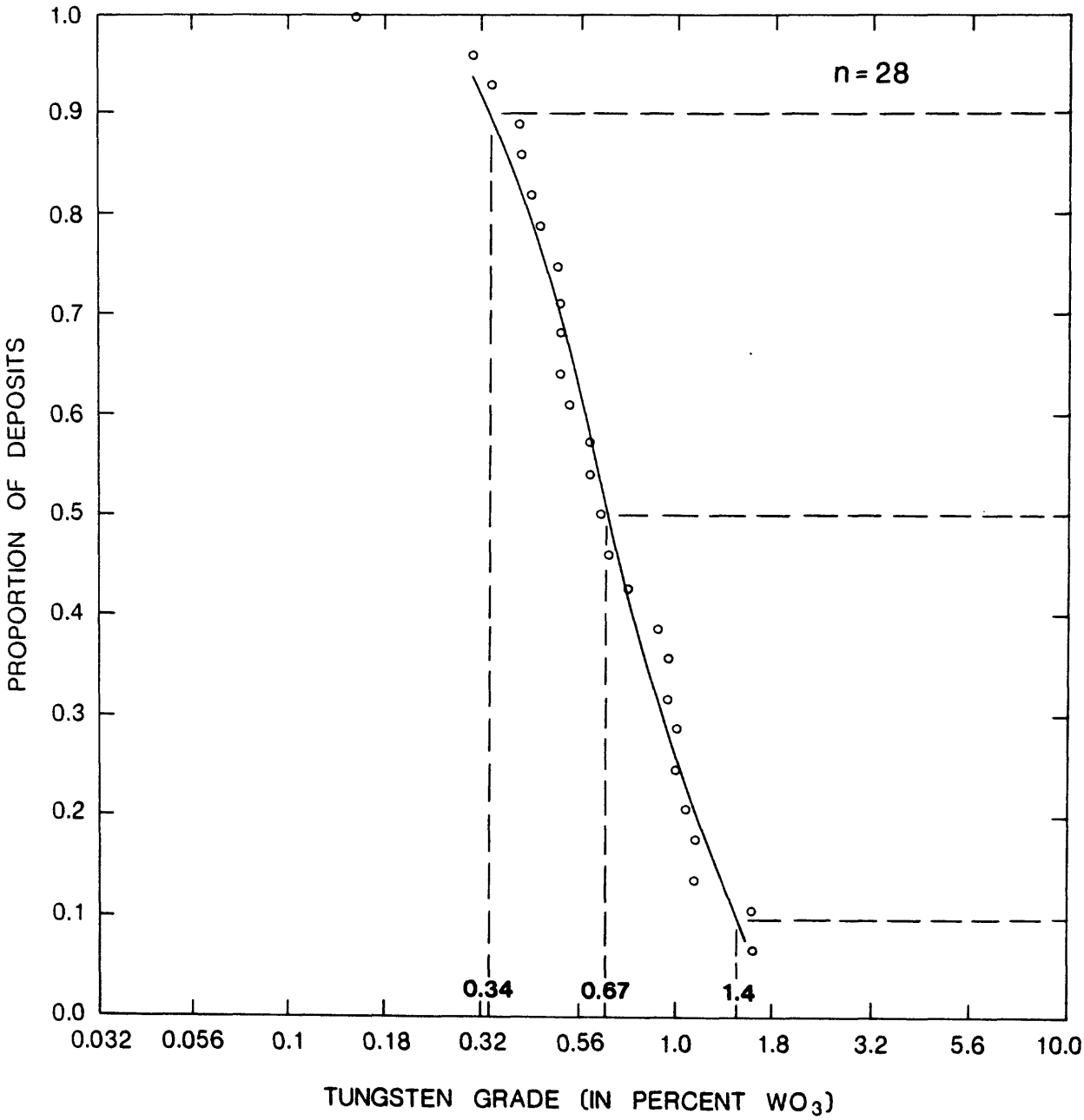
AUTHOR W. D. Menzie and G. M. Jones

COMMENTS Some of the data are from districts. Deposits were combined if they occurred in the same rock units within 10 km of each other.

DEPOSITS

Name	Country
Bailey	CNYT
Brejui	BRZL
Cab	CNYT
Calvert (Red Button)	USMT
Cantung	CNNT
Dublin Gulch (GSZ)	CNYT
Emerald-Dodger	CNBC
Iron Mountain	USNM
King Island	AUTS
Lost Creek	USMT
Lucky Mike	CNBC
Mactung	CNNT
Maykhura	URTD
Milford area	USUT
Nevada-Massachusetts	USNV
Nevada-Scheelite	USNV
Osgood Range	USNV
Pine Creek	USCA
Quixaba	BRZL
Ray Gulch	CNYT
Sang Dong	SKOR
Stormy Group	CNYT
Tem Piute district	USNV
Tyrny-Auz	URRS
Uludag	TRKY
Victory	CNBC
Yellow Pine district	USID
Ysxjoberg	SWDN


TUNGSTEN SKARN
n = 28
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.05
1.1
22
0.0063
0.025
0.1
0.4
1.6
6.3
25
100
400
1600
6300
TONNES (IN MILLIONS)


TUNGSTEN SKARN
n = 28
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.34
0.67
1.4
0.032
0.056
0.1
0.18
0.32
0.56
1.0
1.8
3.2
5.6
10.0
TUNGSTEN GRADE (IN PERCENT WO_3)

DEPOSIT TYPE Cyprus massive sulfide MODEL NUMBER 3.1

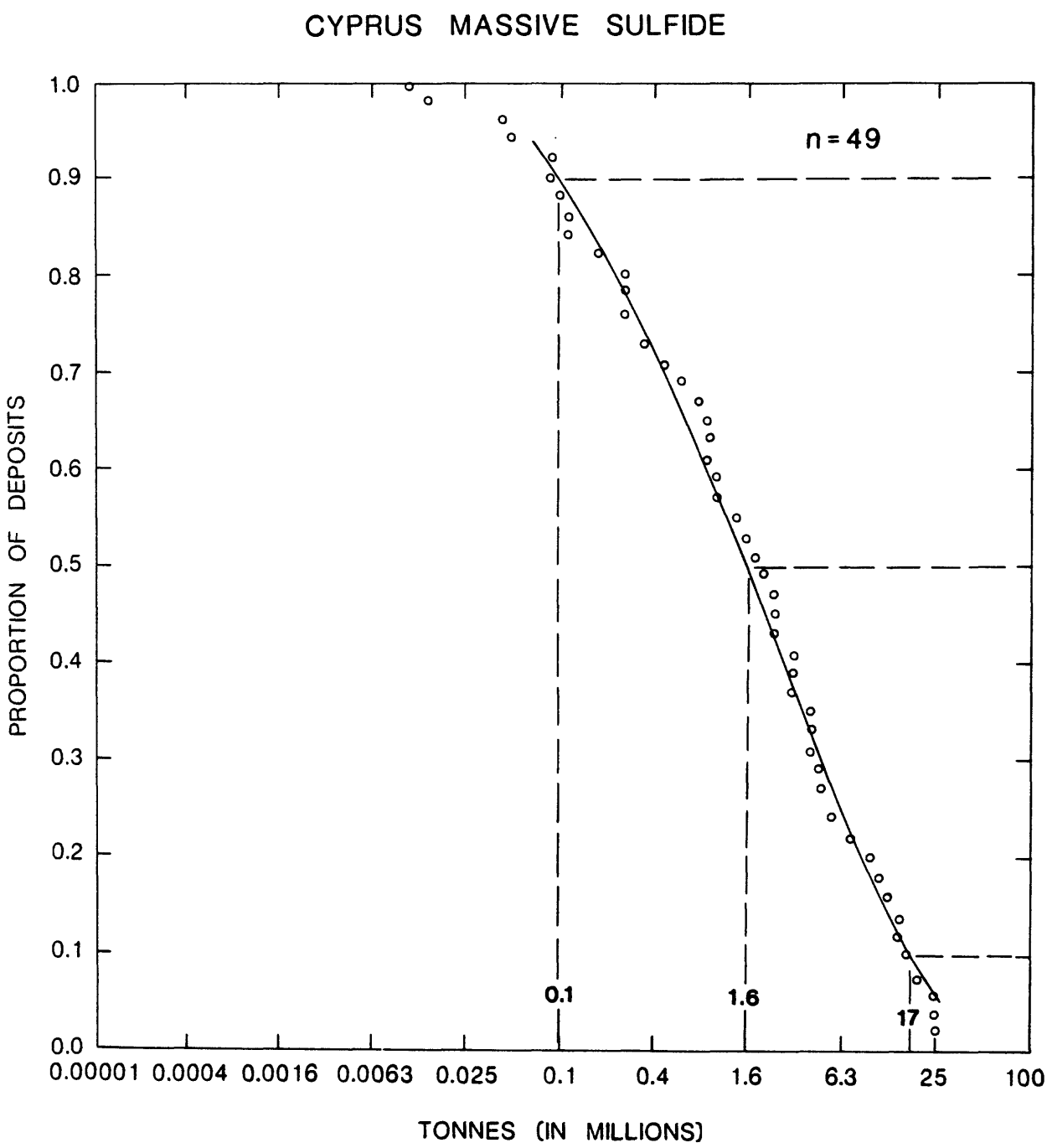
AUTHOR D. A. Singer and D. L. Mosier

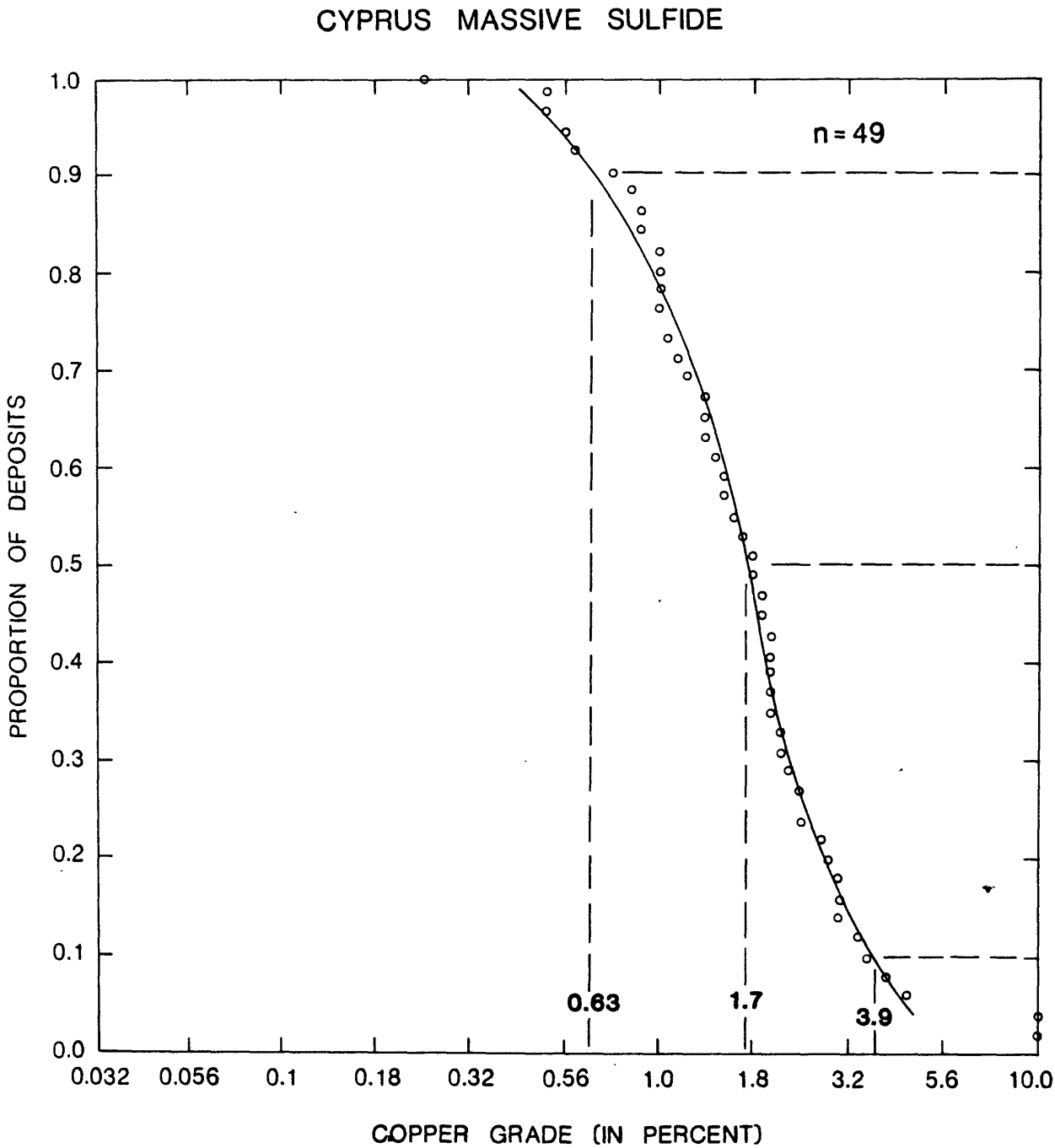
DATA REFERENCES Mosier and others, 1983.

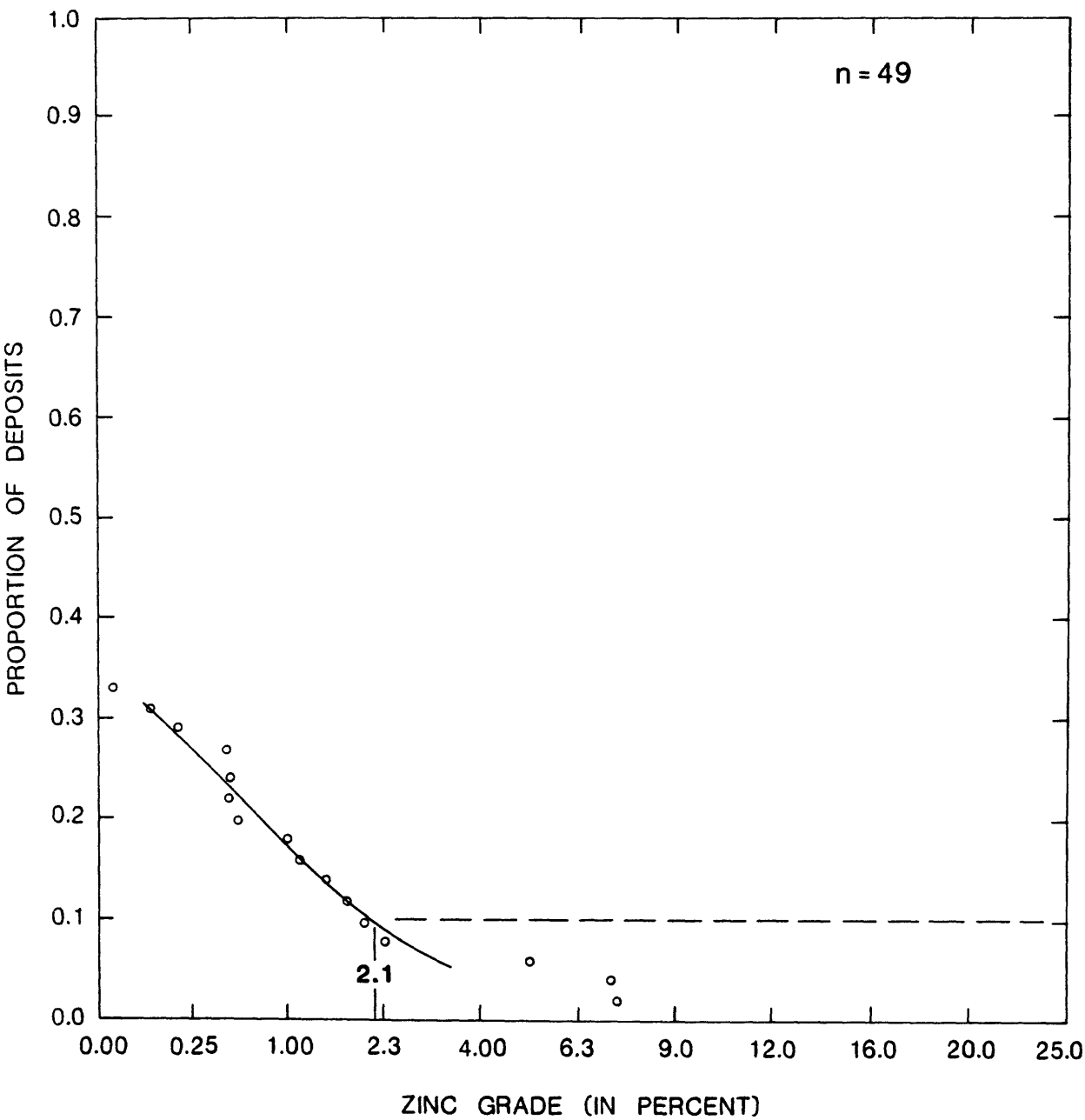
COMMENTS Massive sulfide deposits from Mosier and others (1983) which had only mafic or ultramafic rocks immediately above through 500 m below, and had either pillow basalt or diabase dikes in the sequence were included in these plots. Gold grade is correlated with tonnage at the five percent level ($r = 0.29$).

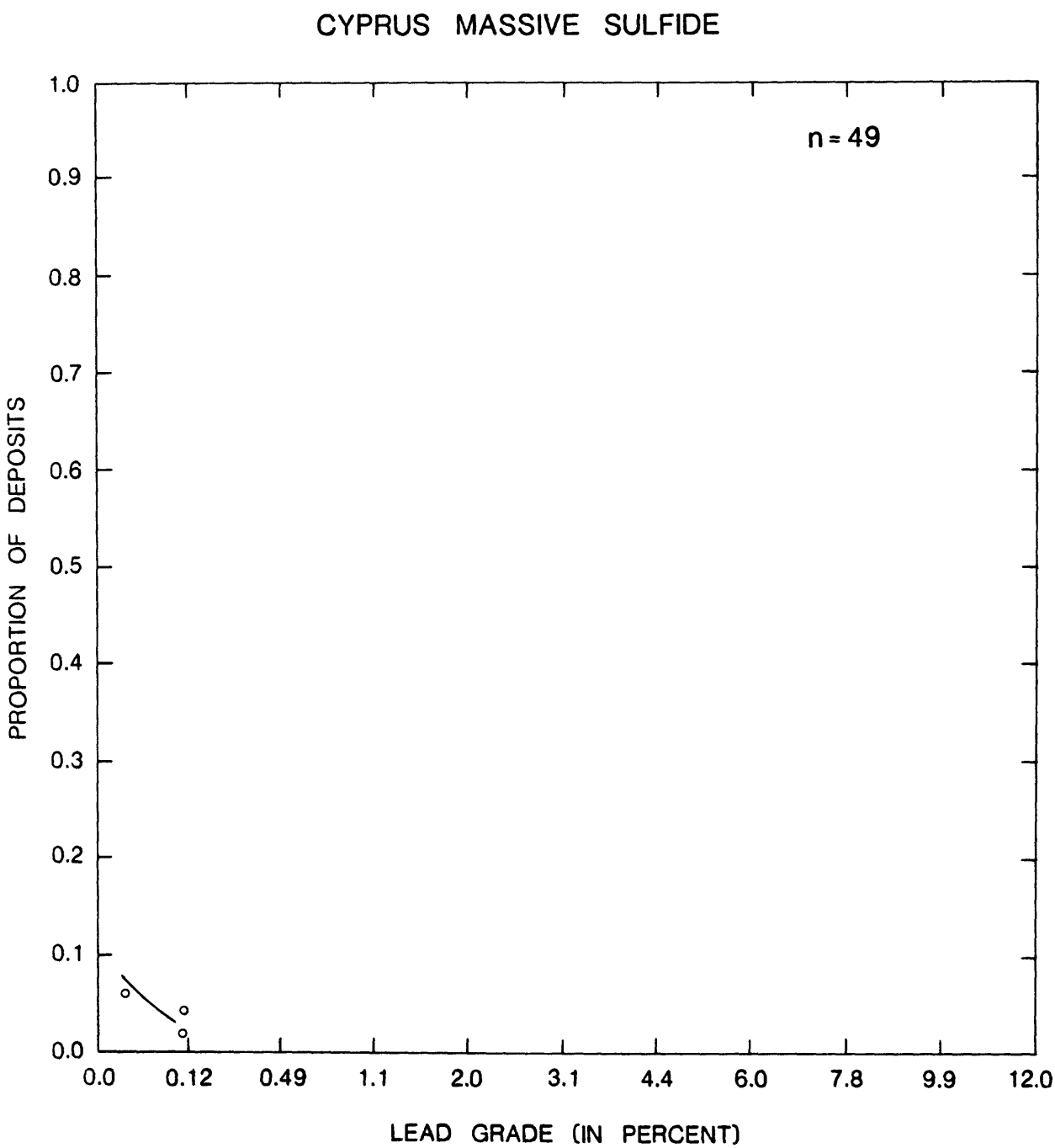
DEPOSITS

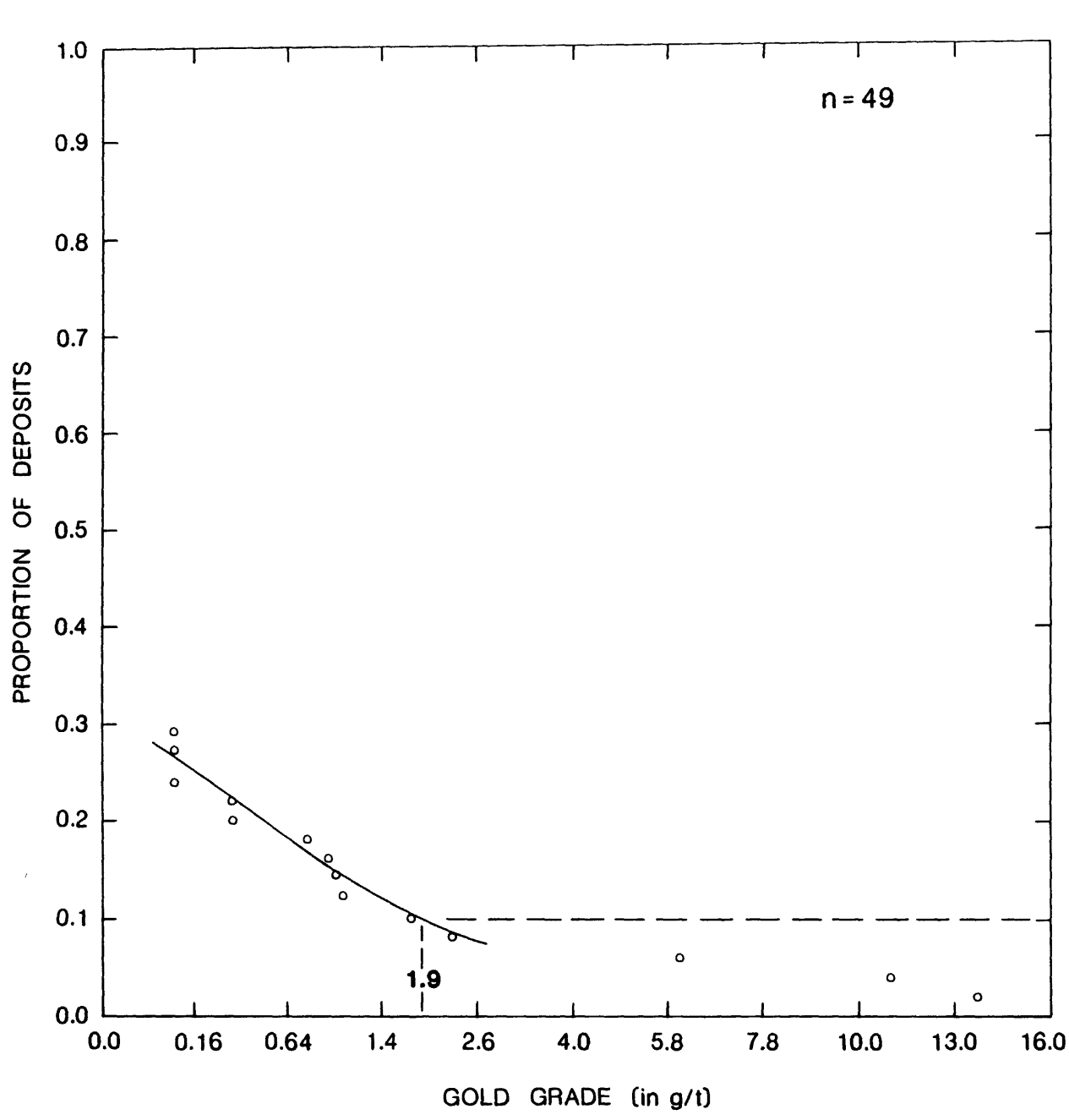
Name	Country	Name	Country
Aarja	OMAN	Lasail	OMAN
Agrokipia	CYPS	Limni	CYPS
Ambelikou	CYPS	Little Bay	CNNF
Ana Yatak-Ergani	TRKY	Lokken	NRWY
Apliki	CYPS	Lorraine	PLPN
Arinteiro	SPAN	Mathiati North	CYPS
Bama	SPAN	Mavrovouni	CYPS
Barlo	PLPN	Mousoulos-Kalavasos	CYPS
Bayda	OMAN	Ny Sulitjelma	NRWY
Betts Cove	CNNF	Oxec	GUAT
Big Mike	USNV	Peravasa	CYPS
Bonanza	CNBC	Platies	CYPS
Bongbongan	PLPN	Rendall-Jackson	CNNF
Carawison	PLPN	Rua Cove	USAK
Carmel	PLPN	Sha	CYPS
Colchester	CNNF	Siirt Madenkoy	TRKY
Fornas	SPAN	Skorovass	NRWY
Hand Camp	CNNF	Skouriotissa	CYPS
Huntingdon	CNQU	Svano	NRWY
Kapedhes	CYPS	Tilt Cove	CNNF
Kokkinoyia	CYPS	Troulli	CYPS
Kokkinopezoula	CYPS	Turner-Albright	USOR
Kure (Asikoy)	TRKY	Whalesback-Little Deer	CNNF
Kure (Bakibaba)	TRKY	York Harbour	CNNF
Kynousa	CYPS		

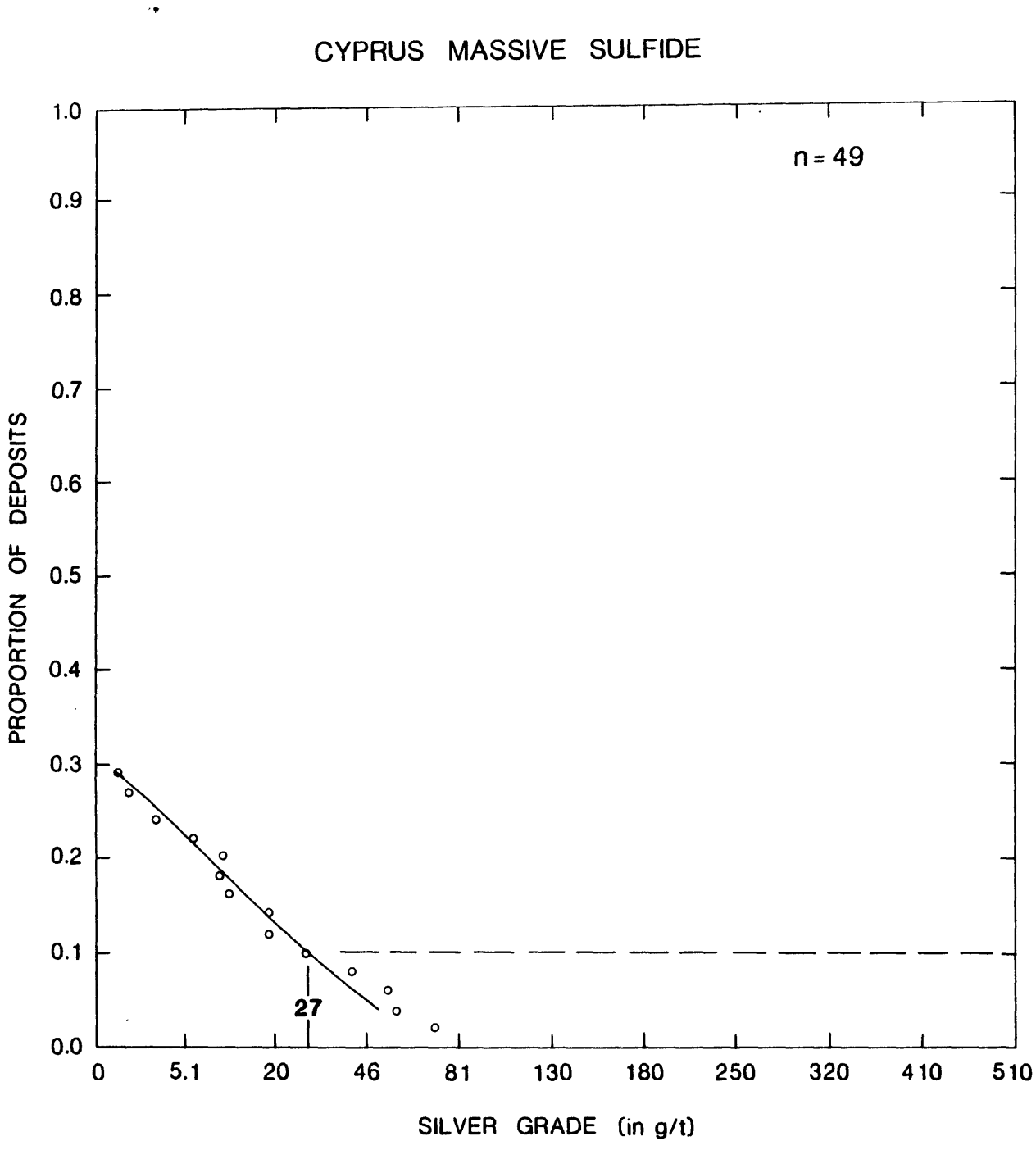

CYPRUS MASSIVE SULFIDE
n = 49
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.1
1.6
17
0.00001 0.0004 0.0016 0.0063 0.025 0.1 0.4 1.6 6.3 25 100
TONNES (IN MILLIONS)


CYPRUS MASSIVE SULFIDE
n = 49
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.63
1.7
3.9
0.032
0.056
0.1
0.18
0.32
0.56
1.0
1.8
3.2
5.6
10.0
COPPER GRADE (IN PERCENT)


CYPRUS MASSIVE SULFIDE
n = 49
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2.1
0.00
0.25
1.00
2.3
4.00
6.3
9.0
12.0
16.0
20.0
25.0
ZINC GRADE (IN PERCENT)


CYPRUS MASSIVE SULFIDE
n = 49
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.12
0.49
1.1
2.0
3.1
4.4
6.0
7.8
9.9
12.0
LEAD GRADE (IN PERCENT)


CYPRUS MASSIVE SULFIDE
n = 49
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1.9
0.0
0.16
0.64
1.4
2.6
4.0
5.8
7.8
10.0
13.0
16.0
GOLD GRADE (in g/t)


CYPRUS MASSIVE SULFIDE
n = 49
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
27
0
5.1
20
46
81
130
180
250
320
410
510
SILVER GRADE (in g/t)

DEPOSIT TYPE Felsic-intermediate massive sulfide MODEL NUMBER 3.2

AUTHOR D. A. Singer and D. L. Mosier

DATA REFERENCES Mosier and others, 1983

COMMENTS Includes all massive sulfides listed by Mosier and others (1983), except the Cyprus deposit type deposits and deposits with only mafic rocks 500 m above and below the deposit. Copper grade is correlated with tonnage at the one percent level ($r = -0.17$) and lead grade is correlated with zinc grade ($r = 0.63$).

DEPOSITS

Name	Country	Name	Country	Name	Country
Abeshiro (Sakura)	JAPN	Bailadores	VNZL	Bodennec	FRNC
Adak-Lindskold	SWDN	Balaklala	USCA	Boliden	SWDN
Afterthought	USCA	Bald Mountain	USME	Bomber	CNMN
Aijala	FNLD	Bandgan	PKTN	Bossmo	NRWY
Akarsen	TRKY	Barrett	USME	Britannia	CNBC
Akkoy	TRKY	Barrington Lake	CNMN	Bruce	USAZ
Akulla Vastra	SWDN	Barvallee-Mogador	CNQU	Brunswick No. 12	CNNB
Albert	CNQU	Baskoy	TRKY	Brunswick No. 6	CNNB
Aldermac	CNQU	Bathurst-Norsemines	CNNT	Buchans (LS-Roth)	CNNF
Allard River	CNQU	Bawdwin	BRMA	Buchans (McLean)	CNNF
Almagrera-Lapilla	SPAN	Beatson	USAK	Buchans (OB-Orient)	CNNF
Amulet A	CNQU	Bedford Hill	CNQU	Bully Hill-Rising St	USCA
Amulet F	CNQU	Bell Allard	CNQU	Bursi	NRWY
Anayatak-Cakmakkaya	TRKY	Bell Channel	CNQU	Campanario	SPAN
Anderson Lake	CNMN	Bidjovagge (A)	NRWY	Canadian Jamieson	CNON
Angelo	AUWA	Bidjovagge (B)	NRWY	Canoe Landing	CNNB
Anne	NRWY	Bidjovagge (C)	NRWY	Captain	CNNB
Antler	USAZ	Bidjovagge (D)	NRWY	Captains Flat	AUNS
Arctic	USAK	Big Bend	USCA	Caribou	CNNB
Armstrong (A)	CNNB	Big Hill	USME	Carpio	SPAN
As Safra	SAAR	Binghampton	USAZ	Castillo Buitron	SPAN
Asen-east	SWDN	Birch Lake	CNSK	Castro Verde	PORT
Asen-west	SWDN	Bjorkasen	NRWY	CC	CNBC
Ash Shizm	SAAR	Bjurfors	SWDN	Centennial	CNMN
Austin Brook	CNNB	Bjurliden	SWDN	Chestatee	USGA
Avoca	IRLD	Bjurtrask	SWDN	Chester	CNNB
Aznacollar	SPAN	Blue Ledge	USCA	Chisel Lake	CNMN
Bagacay	PLPN	Blue Moon	USCA	Clinton	CNQU

(continued on next page)

DEPOSIT TYPE Felsic-intermediate massive sulfide MODEL NUMBER 3.2

DEPOSITS (continued)

Name	Country	Name	Country	Name	Country
Conception	SPAN	Flexar	CNSK	Hood River	CNNT
Conigo	CNQU	Flin Flon	CNMN	Horne-Quemont	CNQU
Copper Crown	CNBC	Fonnfjell	NRWY	Hunter	CNQU
Copper George	AUWA	Fox	CNMN	HW	CNBC
Copper Hill	USCA	Freddie Wells	AUNS	Hyers Island	CNMN
Corbet	CNQU	Fretais	PORT	Iron Dyke	USOR
Coronation	CNSK	Frotet Lake	CNQU	Iron King	USAZ
Crandon	USWI	Fukazawa	JAPN	Iron Mountain	USCA
Cronin	CNBC	Furuhaugen	NRWY	Irsahan	TRKY
Cueva de la Mora	SPAN	Furutobe-Ainai	JAPN	Iso-Magusi-New Insco	CNQU
Cupra D'Estrie	CNQU	Gamle Folldal	NRWY	Israil	TRKY
Cuprus	CNMN	Garon Lake	CNQU	Iwami east	JAPN
Davis	USMS	Gaviao	PORT	Iwami west	JAPN
Deer Isle	USME	Gelvenakko	SWDN	Izok Lake	CNNT
Delbridge	CNQU	George Copper	CNBC	Jabal Sayid	SAAR
Despina	CNQU	Ghost Lake	CNMN	Jakobsbakken	NRWY
Detour	CNQU	Giken-Charlotta	NRWY	Jameland	CNON
Devils Elbow	CNNB	Girilambone	AUNS	Jerome	USAZ
Dickstone	CNMN	Gjersvik	NRWY	Joanne	CNMN
Don Jon	CNMN	Golden Grove	AUWA	Joliet	CNQU
Double Ed	CNBC	Goodenough	CNMN	Josselin	CNQU
Dumagami	CNQU	Gray Eagle	USCA	Joutel	CNQU
Dumont Bourlamque	CNQU	Green Coast	CNON	Kalkanli	TRKY
Dunraine	CNQU	Greens Creek	USAK	Kam Kotia	CNON
Duthie	CNBC	Gullbridge	CNNF	Kamikita (Kominosawa)	JAPN
Dyce Siding	CNMN	Hacan	TRKY	Kankberg	SWDN
Early Bird	USCA	Half Mile Lake (SG)	CNNB	Kelly-Desmond	CNQU
East Sullivan	CNQU	Halliwell	CNQU	Key Anacon	CNNB
Ego	CNON	Hanaoka (Doy-Tsut)	JAPN	Keystone	USCA
Embury Lake	CNMN	Hanaoka (Mats-Sha)	JAPN	Keystone-Union	USCA
Emerson	USME	Hanawa (Aket-Osak)	JAPN	Khans Creek	AUNS
Empire Le Tac	CNQU	Hanson Lake	CNSK	Khnaiguiyah	SAAR
Errington	CNON	Harkoy	TRKY	Kidd Creek	CNON
Estacao	PORT	Heath Steele (A-C-D)	CNNB	Killingdal	NRWY
Eulaminna	AUWA	Heath Steele (B)	CNNB	Kimheden	SWDN
Eustis	CNQU	Heath Steele (E-F)	CNNB	Kittelgruvan	SWDN
F Group	CNON	Heimtjonnho	NRWY	Kizilkaya	TRKY
Farewell Lake	CNMN	Hercules	AUTS	Koff Zone	CNMN
Filon Sur-Esperanza	SPAN	Herrerias	SPAN	Koprubasi	TRKY
Fjeldgruve	NRWY	Hersjo	NRWY	Kosaka (Motoyama)	JAPN
FL & DH	CNMN	High Lake	CNNT	Kosaka (Uch-Uwa)	JAPN
Flambeau	USWI	Hixbar	PLPN	Kostere	TRKY
Flat Landing	CNNB	Hoidal	NRWY	Kristineberg	SWDN

(continued on next page)

DEPOSIT TYPE Felsic-intermediate massive sulfide MODEL NUMBER 3.2

DEPOSITS (continued)

Name	Country	Name	Country	Name	Country
Kunitomi (3-4-6)	JAPN	Moleon Lake	CNQU	Pelican	USWI
Kunitomi (7-8)	JAPN	Monpas	CNQU	Penn	USCA
Kunitomi (1-5-1N-Fud)	JAPN	Mons Cupri	AUWA	Perrunal	SPAN
Kurosawa	JAPN	Mordey	CNON	Phelps Dodge	CNQU
Kutcho Creek	CNBC	Mos	NRWY	Pilleys Island	CNNF
Kutlular	TRKY	Moskogaissa	NRWY	Pine Bay	CNMN
Kuvarshan	TRKY	Moulton Hill	CNQU	Piray	PLPN
La Joya	SPAN	Mount Bulga	AUNS	Point Leamington	CNNF
La Torrera	SPAN	Mount Chalmers	AUQL	Poirier	CNQU
La Zarza	SPAN	Mount Lyell	AUTS	Port Aux Moines	FRNC
Lagunazo	SPAN	Mount Morgan	AUQL	Pot Lake	CNMN
Lahanos	TRKY	Mount Mulcahy	AUWA	Price	CNBC
Lake Dufault	CNQU	Murgul	TRKY	Pyhasalmi	FNLD
Lancha	SPAN	Murray Brook	CNNB	Que River	AUTS
Langdal	SWDN	Myra Falls-Lynx	CNBC	Quebec Manitou	CNQU
Langsele	SWDN	Nasliden	SWDN	Radiore E	CNQU
Lenora-Twin J	CNBC	Nepisiguit	CNNB	Rail Lake	CNMN
Levi	SWDN	New Bay Pond	CNNF	Rakkejaur	SWDN
Lillebo	NRWY	New Hosco	CNQU	Rambler-Ming	CNNF
Lost Lake	CNMN	Newton	USCA	Ramsey	CNSK
Lousal	PORT	Nine Mile Brook	CNNB	Ravliden	SWDN
Louvem	CNQU	Nordre Gjetryggen	NRWY	Ravlidmyran	SWDN
Lyndhurst	CNQU	Norita	CNQU	Rosebery-Read	AUTS
Lynx	CNQU	Normetal	CNQU	Red Wing	CNBC
Lyon Lake	CNON	North Boundary	CNNB	Reed Lake	CNMN
MacBride Lake	CNMN	North Keystone	USCA	Renstrom	SWDN
Madenkoy	TRKY	North Star	CNMN	Rieppe	NRWY
Malaiba	PLPN	Northair	CNBC	Rio Tinto	SPAN
Mamie	CNBC	Nuqrah	SAAR	Rocky Turn	CNNB
Mammoth	USCA	Old Waite	CNQU	Rod	CNMN
Mandy	CNMN	Orange Point	USAK	Rodhammeren	NRWY
Mankayan	PLPN	Orchan	CNQU	Rodkleiv	NRWY
Marcos	PLPN	Orijarvi	FNLD	Romanera	SPAN
Mattabi	CNON	Osbourne Lake	CNMN	Romerito	SPAN
Mattagami Lake	CNQU	Oshio	JAPN	Rostvangen	NRWY
McMaster	CNNB	Ostra Hogkulla	SWDN	Rudtjebacken	SWDN
Metsamonttu	FNLD	Pabineau River	CNNB	Ruttan	CNMN
Mic Mac	CNQU	Paronen	FNLD	Sabetjok	NRWY
Millenbach	CNQU	Parys Mountain	GRBR	Sagmo	NRWY
Mobrun	CNQU	Pasuquin	PLPN	Sain Bel	FRNC
Mofjell	NRWY	Pater	CNON	San Antonio	SPAN
Moinho	PORT	Paymogo	SPAN	San Domingos	PORT
Mokoman Lake	CNSK	Pecos	USNM	San Guillermo-Sierra	SPAN

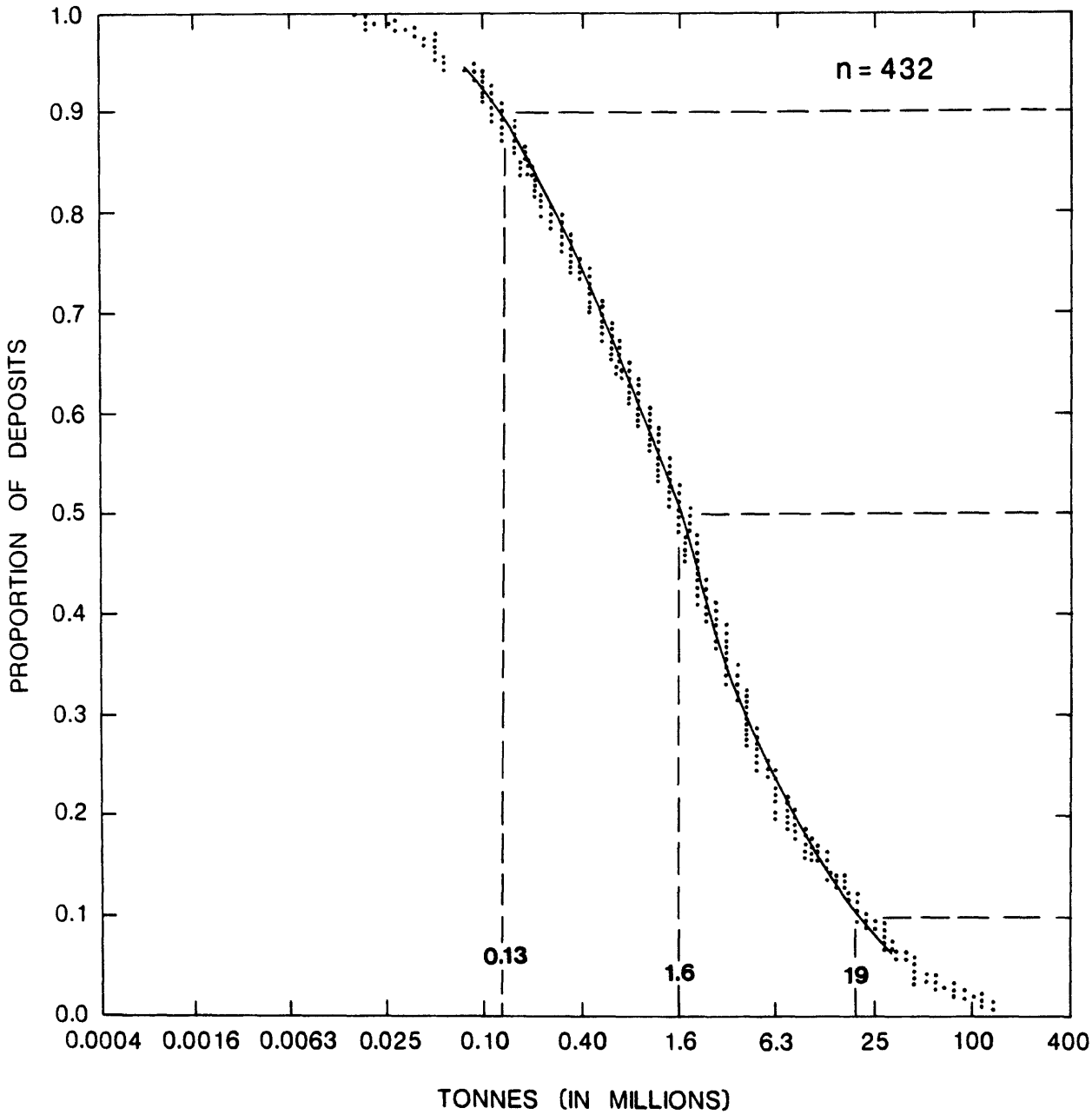
(continued on next page)

DEPOSIT TYPE Felsic-intermediate massive sulfide MODEL NUMBER 3.2

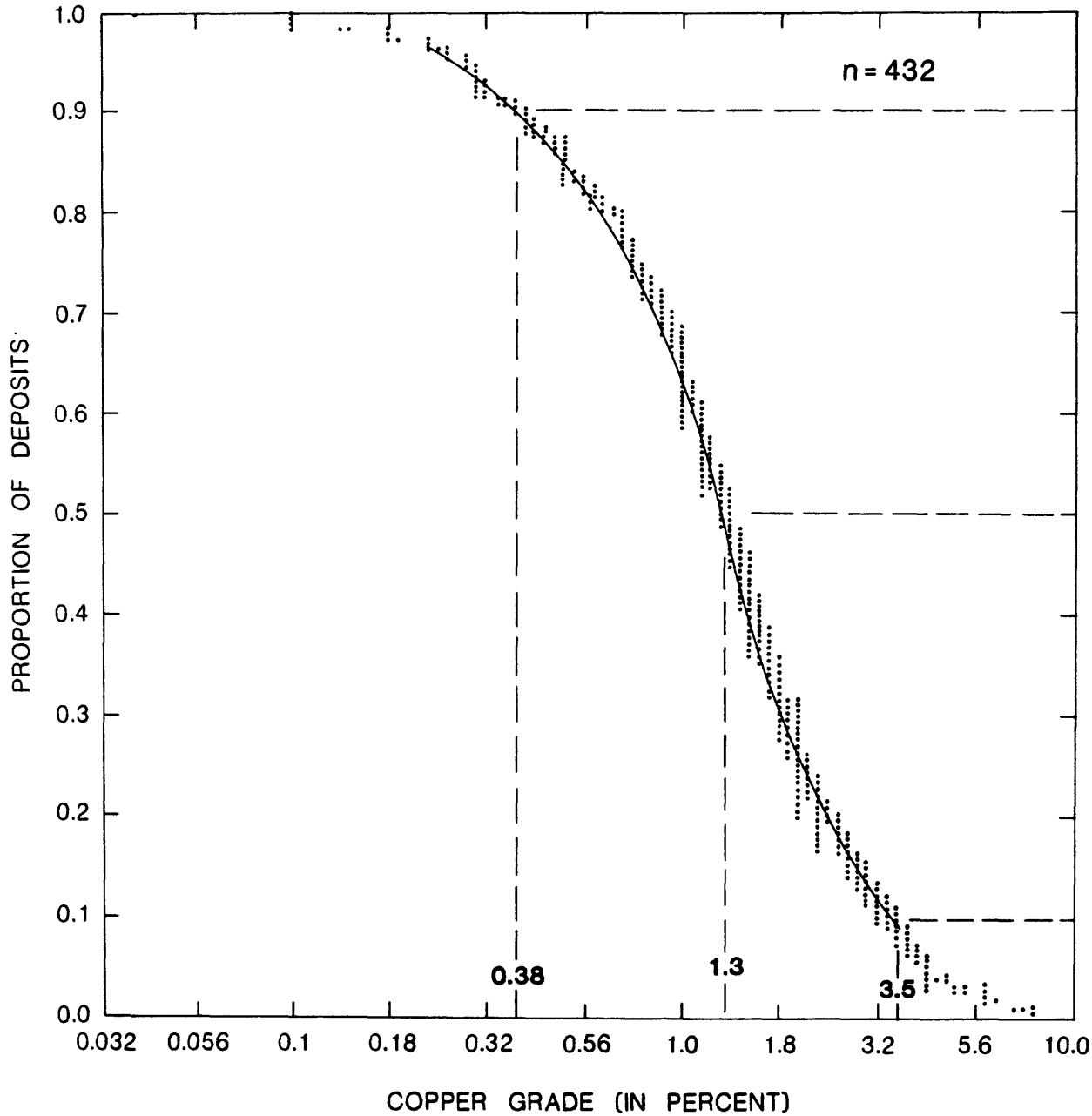
DEPOSITS (continued)

Name	Country	Name	Country
San Mateo	PLPN	Third Portage	CNNB
San Pedro	SPAN	Tjokkola	SWDN
San Platon	SPAN	Tomogonops	CNNB
San Telmo	SPAN	Trinity	CNQU
Santa Rosa	SPAN	Trout Bay	CNON
Schist Lake	CNMN	Tsuchihata (Hatabira)	JAPN
Selco-Scott	CNQU	Tsuchihata (Honniozaw)	JAPN
Shasta King	USCA	Tsuchihata (Shiratsuc)	JAPN
Shunsby	CNON	Tsuchihata (Uenono-Ok)	JAPN
Sierrecilla	SPAN	Tsuchihata (Washinosu)	JAPN
Silver Queen	CNBC	Tulk's Pond	CNNF
Skaide	NRWY	Tulsequah	CNBC
Solbec	CNQU	Tunca	TRKY
Sotiel	SPAN	Tverrfjellet	NRWY
Sourdough Bay	CNMN	Uchi	CNON
South Dufault	CNQU	Udden	SWDN
South Rusty Hill	CNQU	Undu	FIJI
Spenceville	USCA	Vaddas	NRWY
Spruce Point	CNMN	Vamp	CNMN
Stall Lake	CNMN	Vauze	CNQU
Stekenjokk	SWDN	Vermillion	CNON
Stirling	CNNS	Vigsnes	NRWY
Stowell	USCA	Viscaria	SWDN
Stralak	CNON	Waden Bay	CNSK
Stratmat	CNNB	Waite East	CNQU
Sturgeon Lake	CNON	Wallaroo	AUWA
Suffield	CNQU	Wedge	CNNB
Sulat	PLPN	Weedon	CNQU
Sun	CNMN	Weiss	TRKY
Sunshine	CNBC	West McDonald	CNQU
Susu Lake	CNNT	Westarm	CNMN
Sutro	USCA	Whim Creek	AUWA
Tache Lake	CNQU	White Lake	CNMN
Taisho (Nishimata)	JAPN	Whundo	AUWA
Takijug Lake	CNNT	Wildcat	PLPN
Taknar I	IRAN	Willecho	CNON
Taknar II	IRAN	Wim	CNMN
Tapley	USME	Windy	CNBC
Tashiro	JAPN	Woodlawn	AUQL
Taslica	TRKY	Yava	CNNT
Teahan	CNNB	Yoichi	JAPN
Tedi	CNBC	Yokota (Motoyama-Hama)	JAPN
Terra Nova	CNNF	Yoshino (Hisaka)	JAPN
Teutonic Bore	AUWA	Yoshino (Main)	JAPN
Texas	CNNB	Z	CNMN

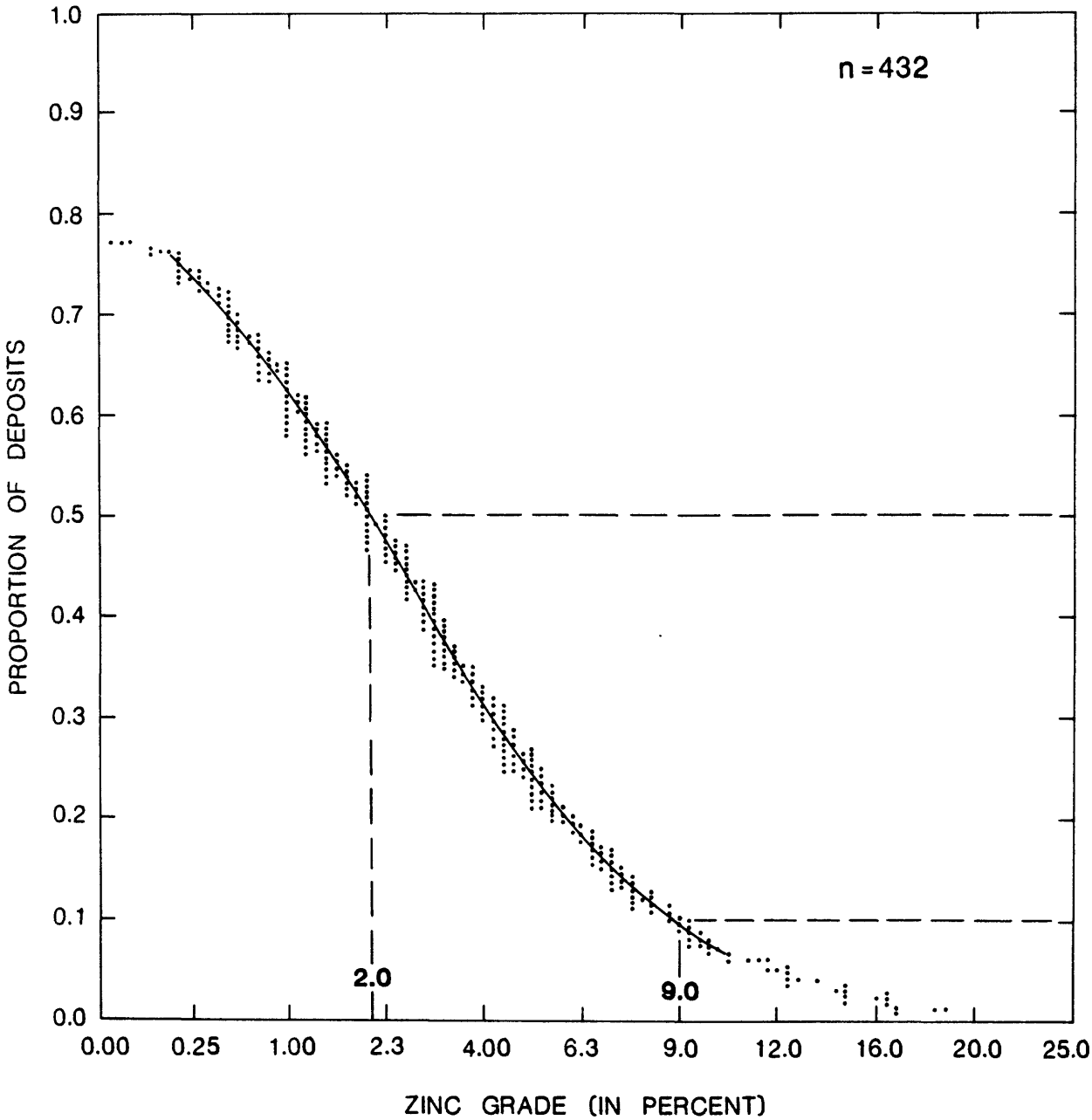
FELSIC - INTERMEDIATE MASSIVE SULFIDE

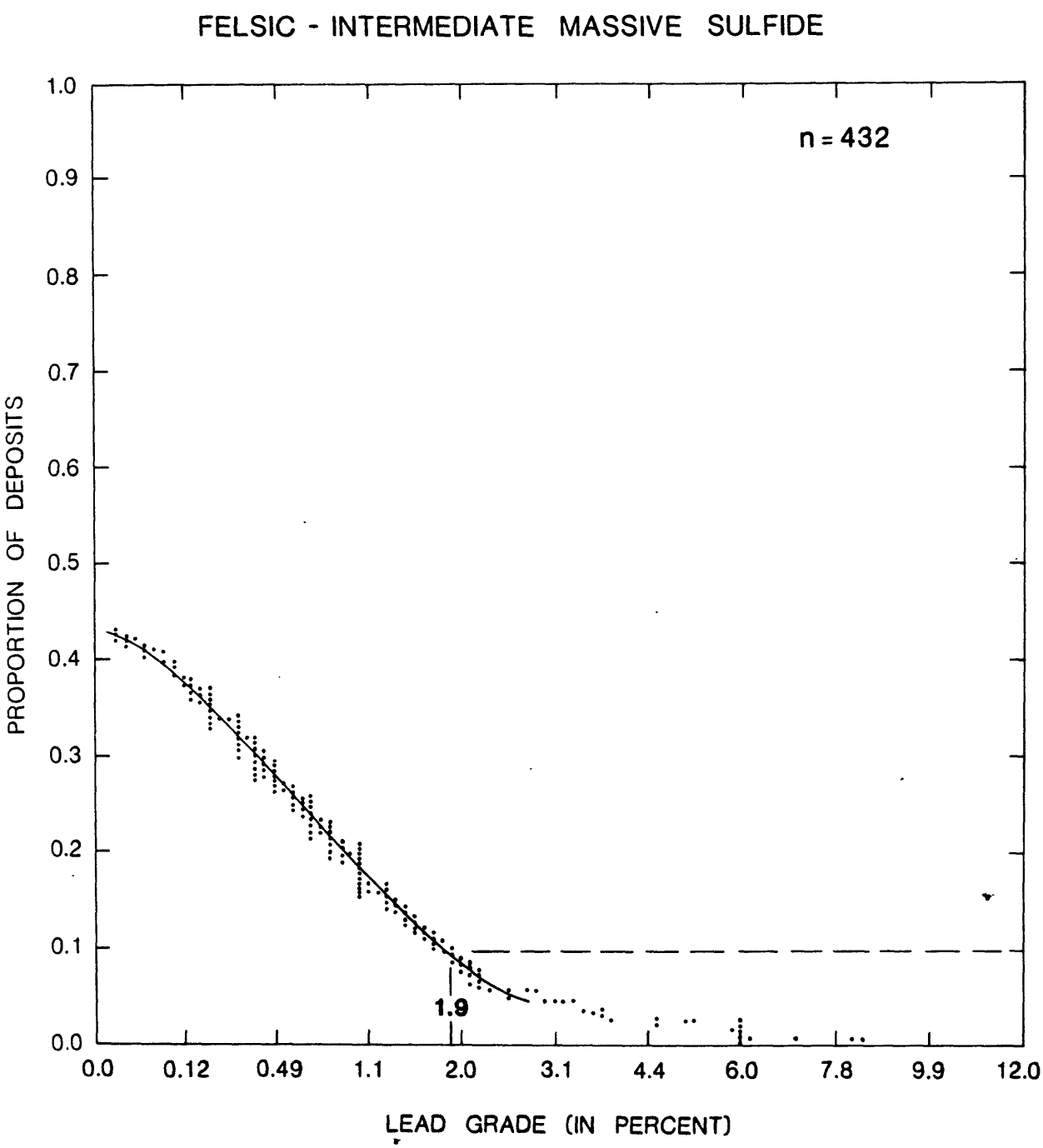


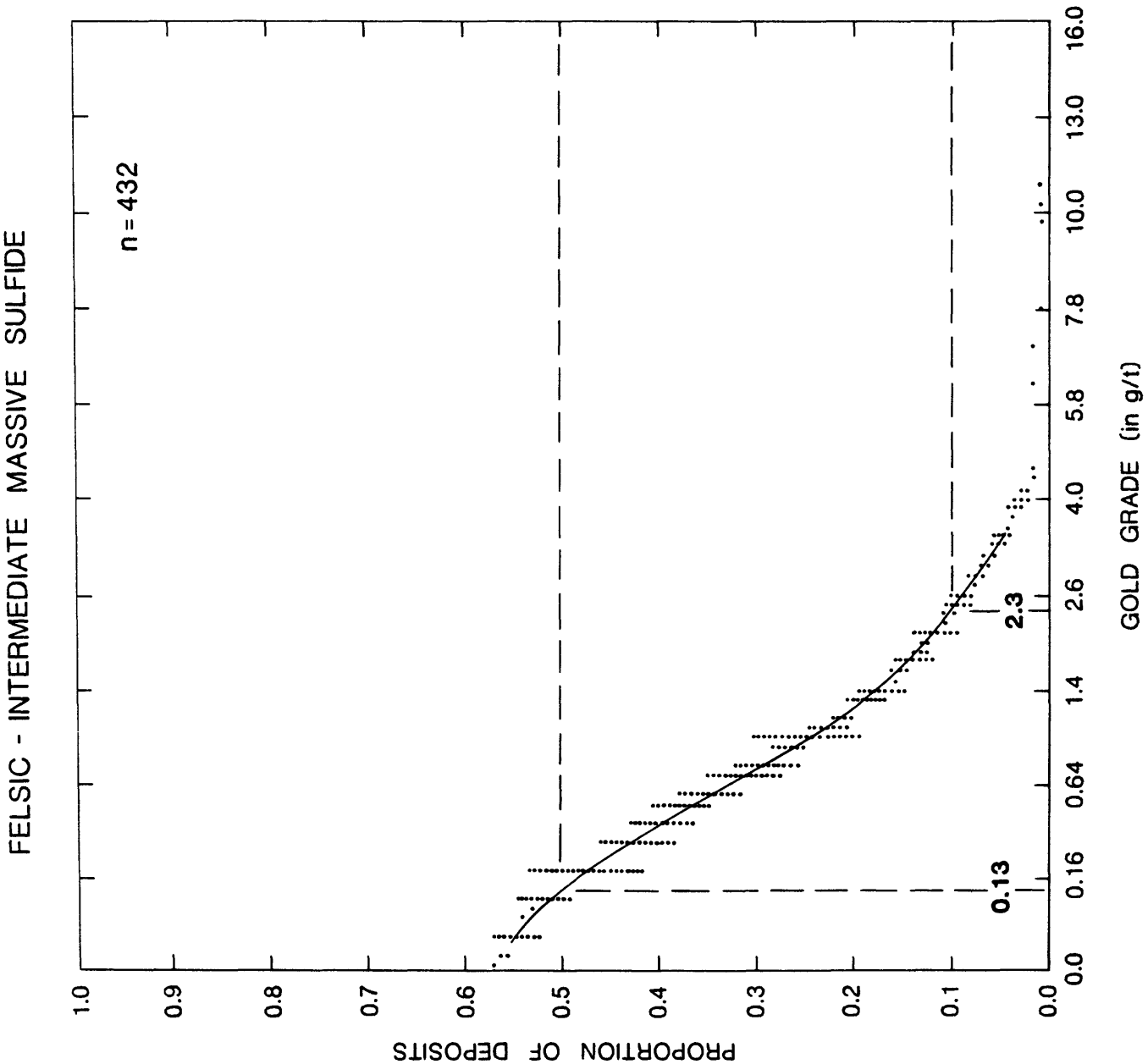
FELSIC - INTERMEDIATE MASSIVE SULFIDE

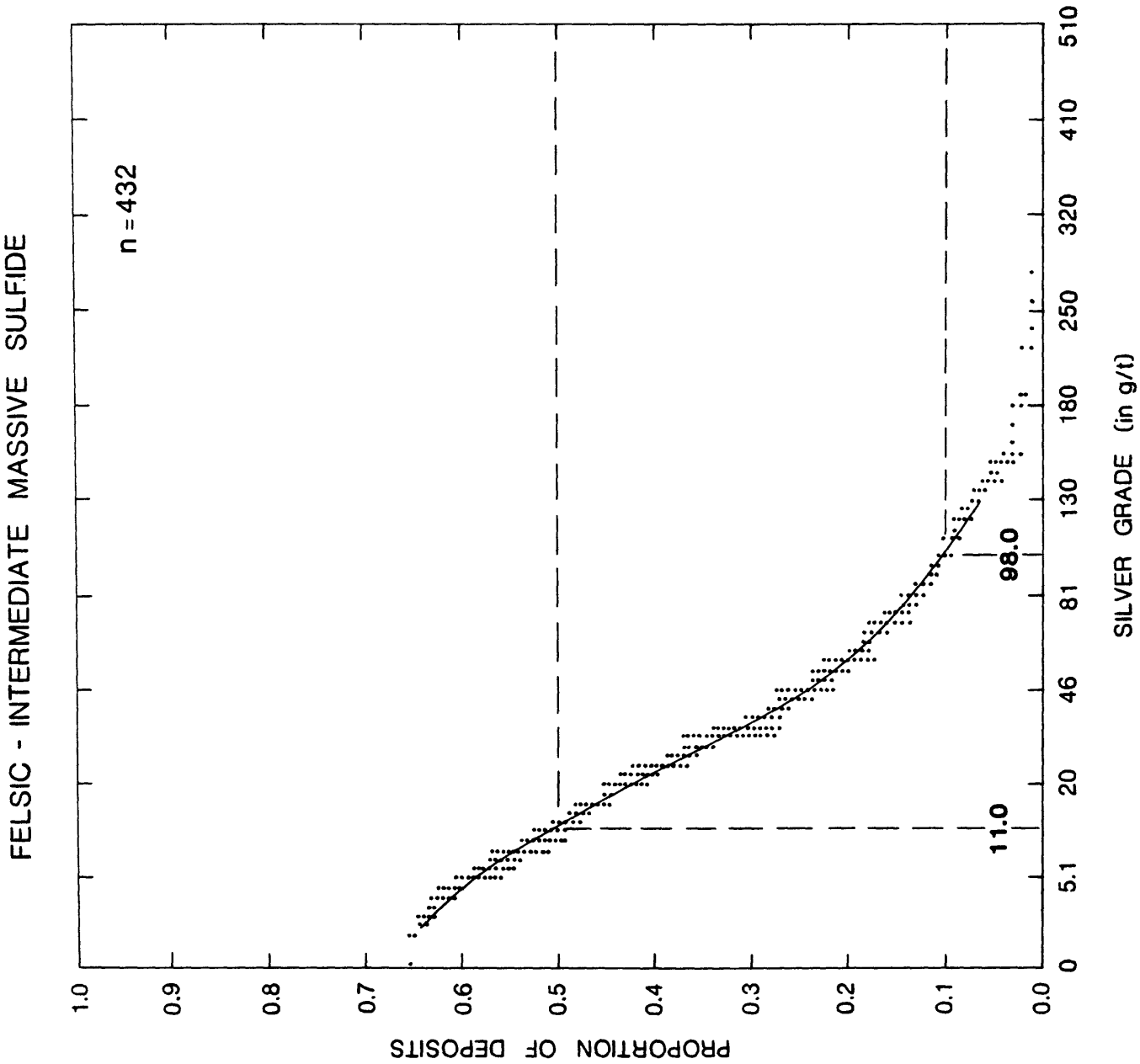


FELSIC - INTERMEDIATE MASSIVE SULFIDE




FELSIC - INTERMEDIATE MASSIVE SULFIDE
n = 432
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1.9
0.0
0.12
0.49
1.1
2.0
3.1
4.4
6.0
7.8
9.9
12.0
LEAD GRADE (IN PERCENT)


FELSIC - INTERMEDIATE MASSIVE SULFIDE
n = 432
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.16
0.64
1.4
2.6
4.0
5.8
7.8
10.0
13.0
16.0
GOLD GRADE (in g/t)
0.13
2.3


FELSIC - INTERMEDIATE MASSIVE SULFIDE
n = 432
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
11.0
98.0
0
5.1
20
46
81
130
180
250
320
410
510
SILVER GRADE (in g/t)

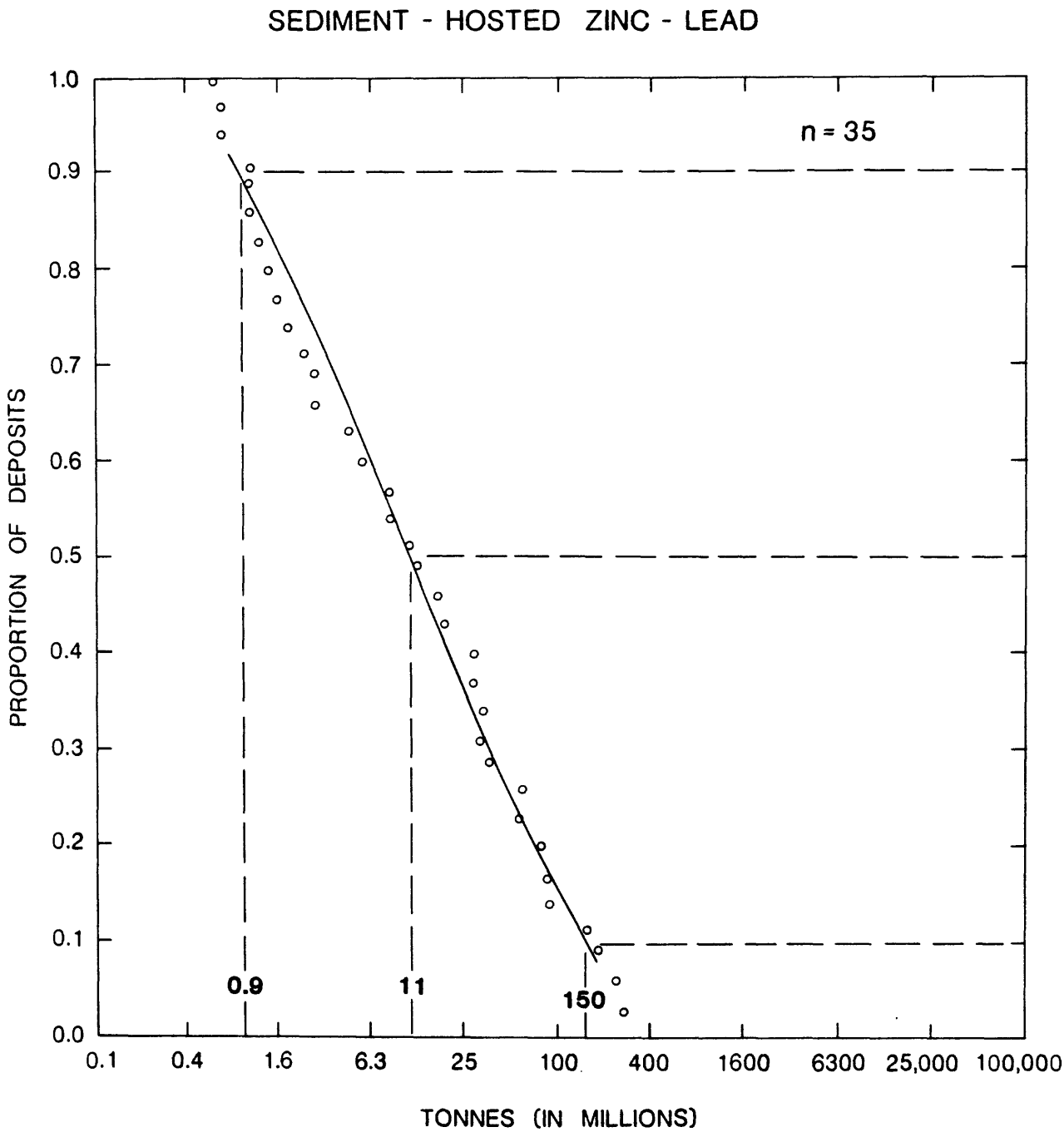
DEPOSIT TYPE Sediment-hosted exhalative zinc-lead MODEL NUMBER 4.5

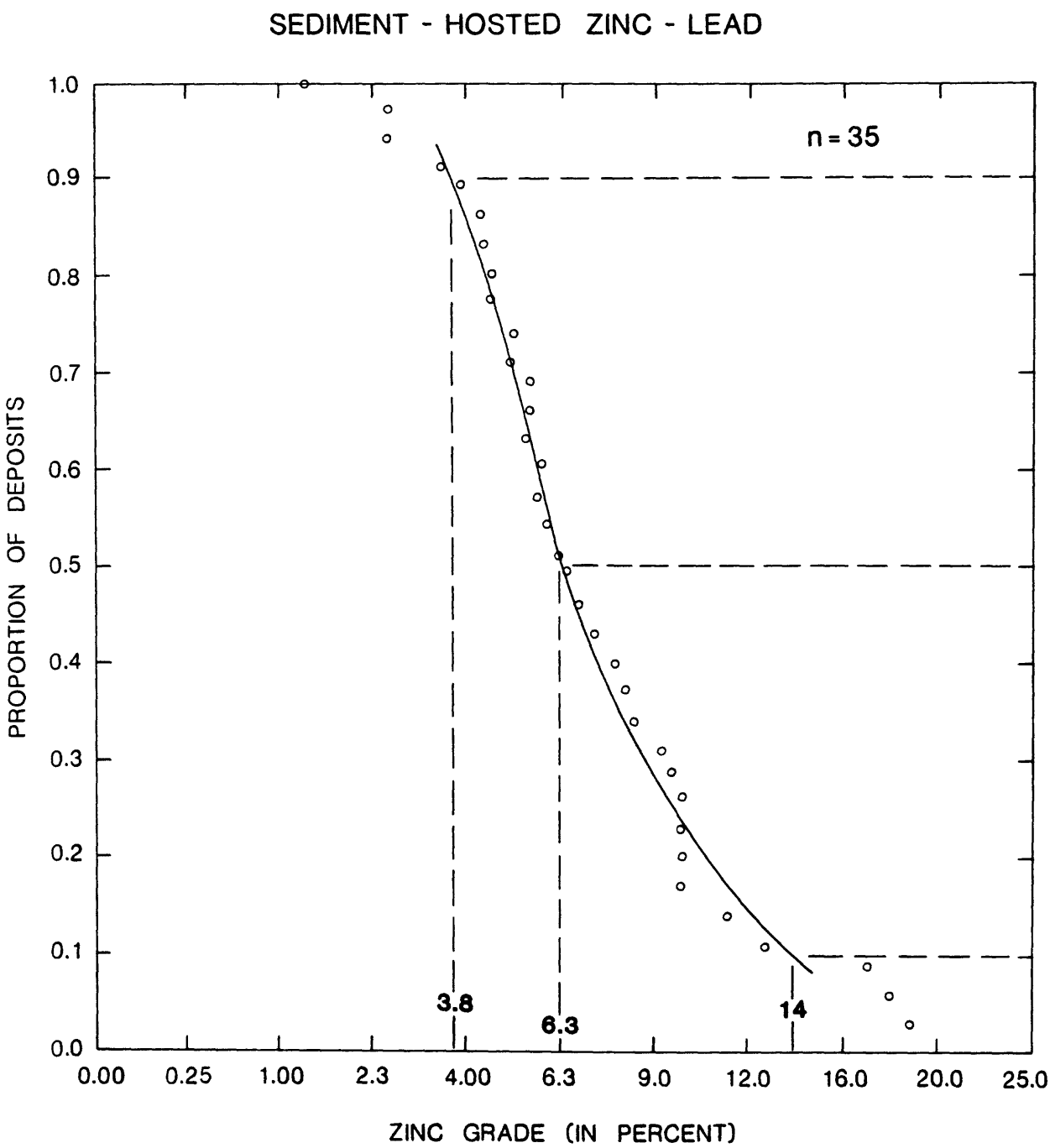
AUTHOR W. D. Menzie and D. L. Mosier

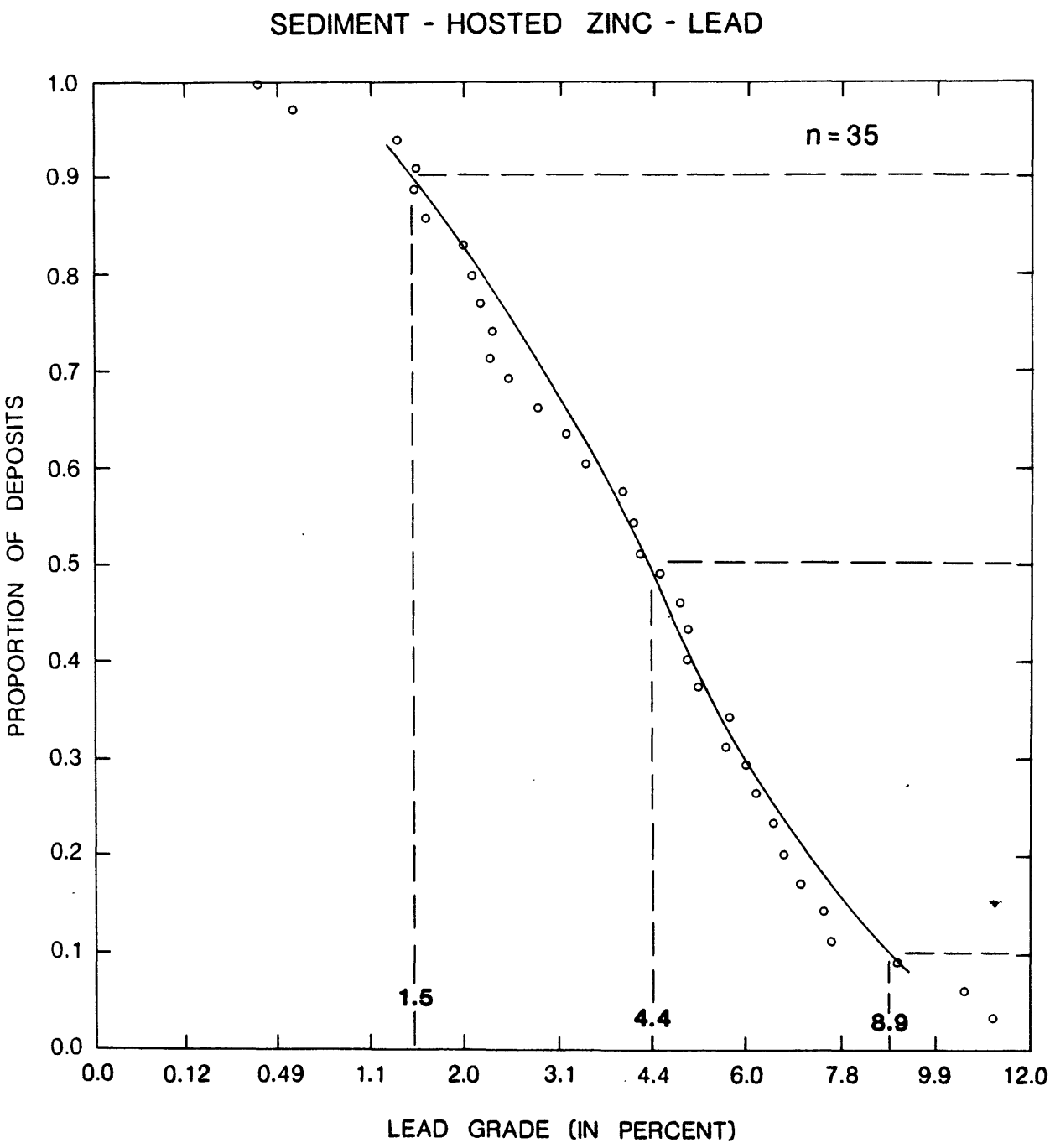
COMMENTS Lead grades are significantly correlated with silver grades (r = 0.76).

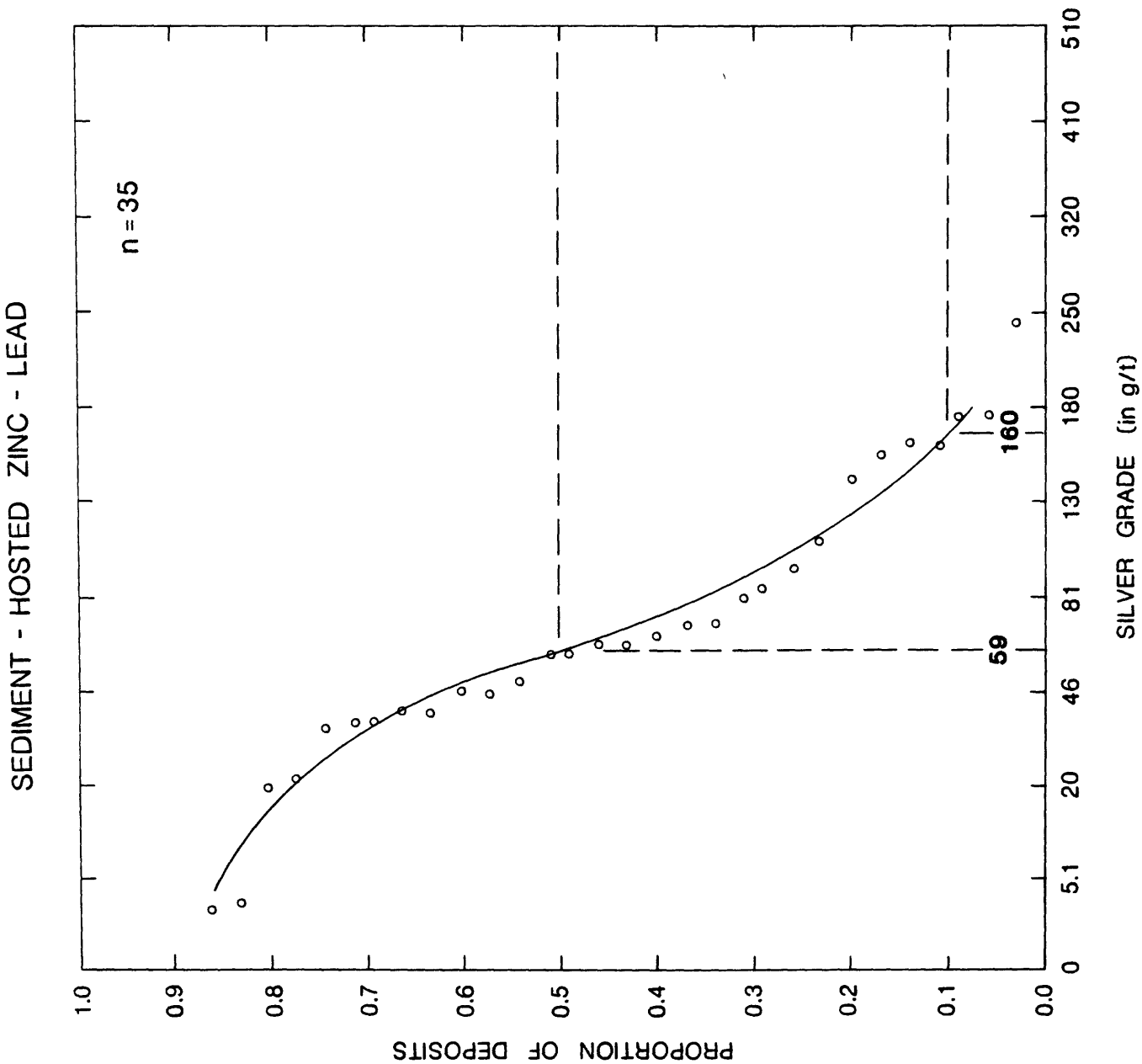
DEPOSITS

Name	Country
Abbeytown	IRLD
Broken Hill	AUNS
Cirque	CNBC
Cotton Belt	CNBC
Dugald River	AUQL
Elura	AUNS
Faro	CNYT
Fx	CNBC
Grum	CNYT
Hilton	AUQL
Homestake	CNBC
Howards Pass	CNYT
King Fissure	CNBC
Lady Loretta	AUQL
MacMillan	CNYT
Matt Berry	CNYT
McArthur	AUNT
Meggen	GRMY
Mel	CNYT
Mineral King	CNBC
Mount Isa	AUQL
Navan	IRLD
Rammelsberg	GRMY
Red Dog	USAK
River Jordan	CNBC
Rosh Pinah	SAFR
St. Eugene	CNBC
Silvermines	IRLD
Squirrel Hills	AUQL
Sullivan	CNBC
Swim Lake	CNYT
Tom	CNYT
Tynagh	IRLD
Vangorda	CNYT
Woodcutters	AUNT


SEDIMENT - HOSTED ZINC - LEAD
n = 35
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.9
11
150
0.1
0.4
1.6
6.3
25
100
400
1600
6300
25,000
100,000
TONNES (IN MILLIONS)


SEDIMENT - HOSTED ZINC - LEAD
n = 35
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
3.8
6.3
14
0.00
0.25
1.00
2.3
4.00
6.3
9.0
12.0
16.0
20.0
25.0
ZINC GRADE (IN PERCENT)


SEDIMENT - HOSTED ZINC - LEAD
n = 35
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1.5
4.4
8.9
0.0
0.12
0.49
1.1
2.0
3.1
4.4
6.0
7.8
9.9
12.0
LEAD GRADE (IN PERCENT)


SEDIMENT - HOSTED ZINC - LEAD
n = 35
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
5.1
20
46
81
130
180
250
320
410
510
59
160
SILVER GRADE (in g/t)

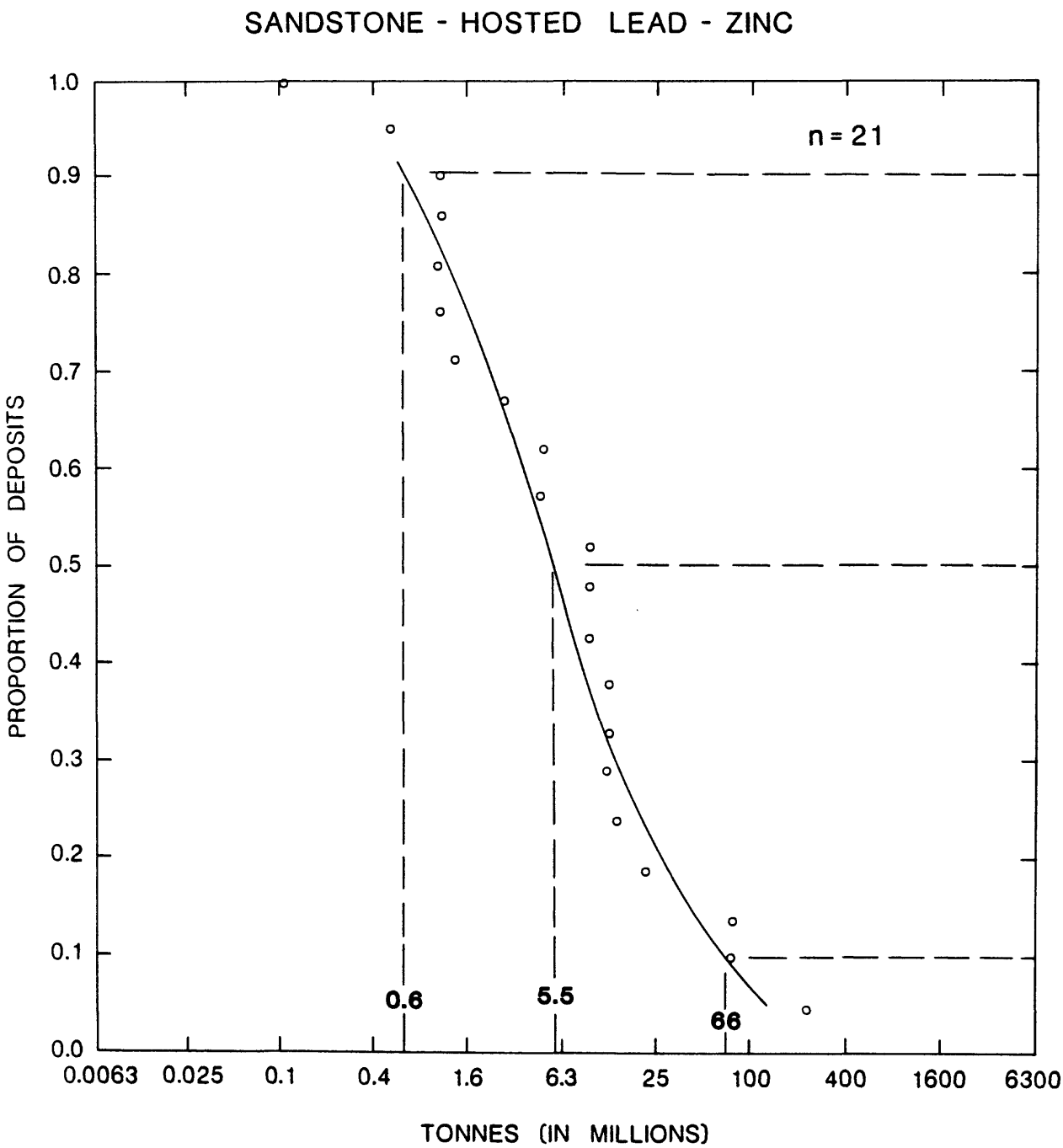
DEPOSIT TYPE Sandstone-hosted lead-zinc MODEL NUMBER 4.8

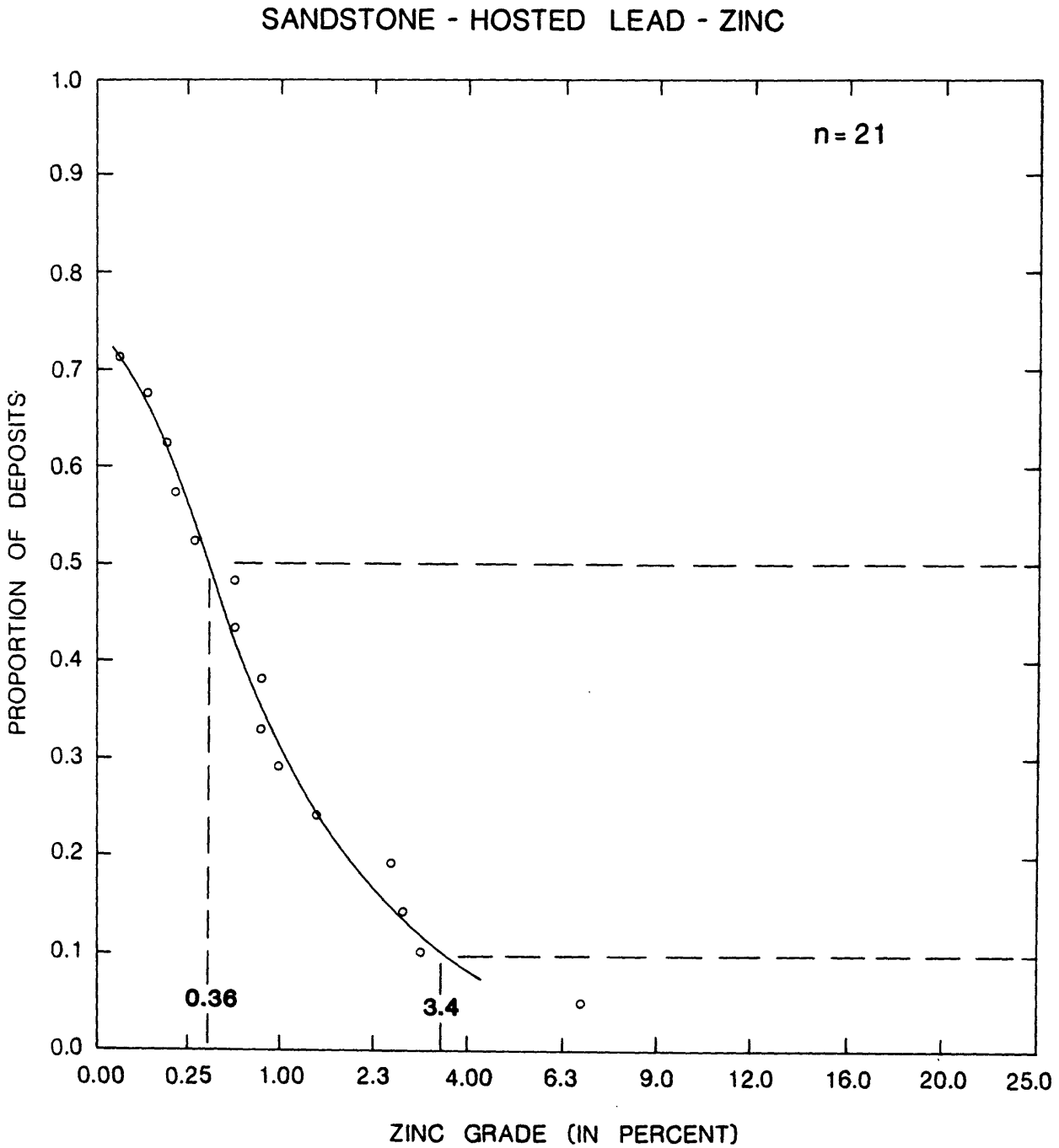
AUTHOR D. L. Mosier

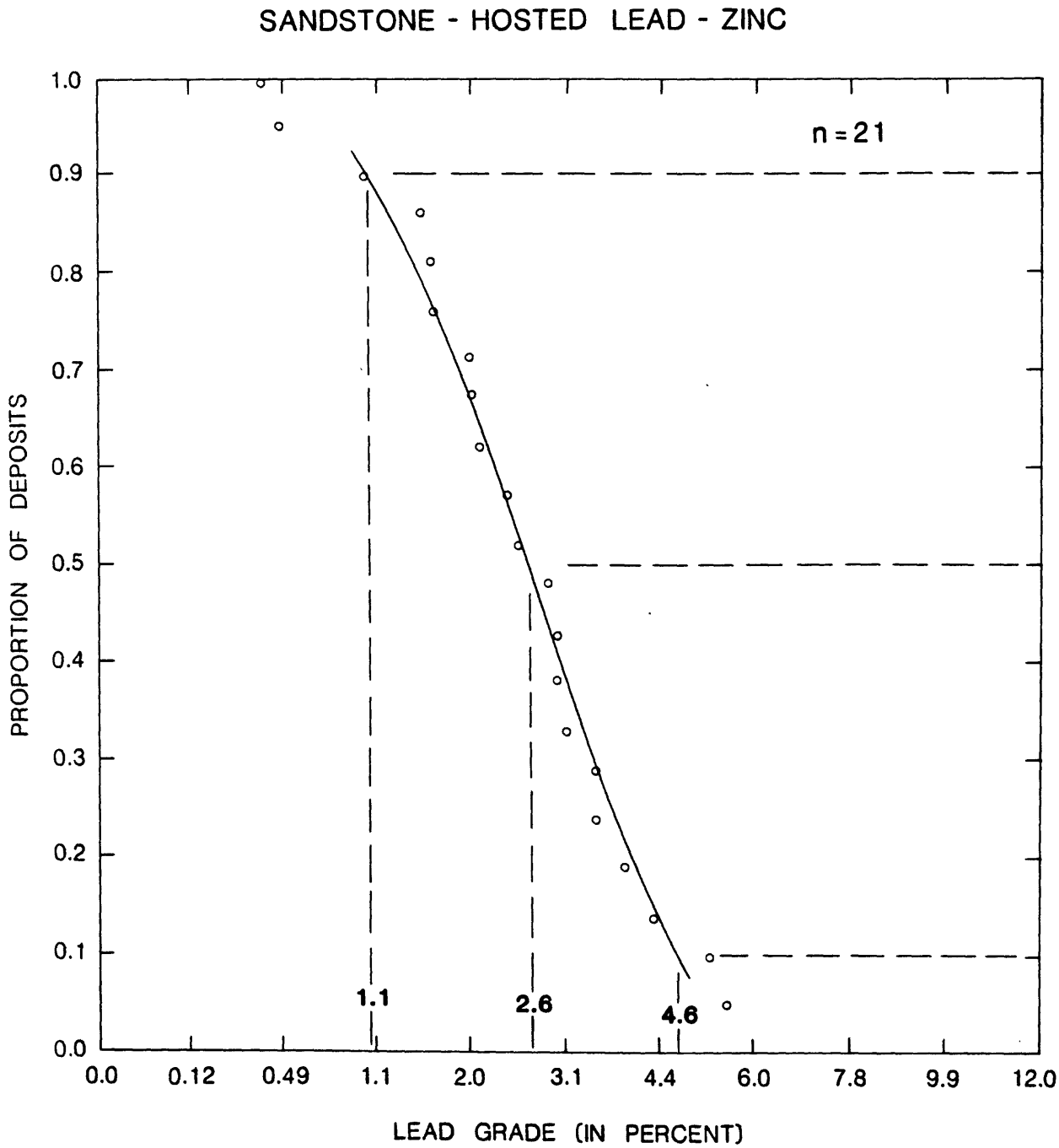
COMMENTS none

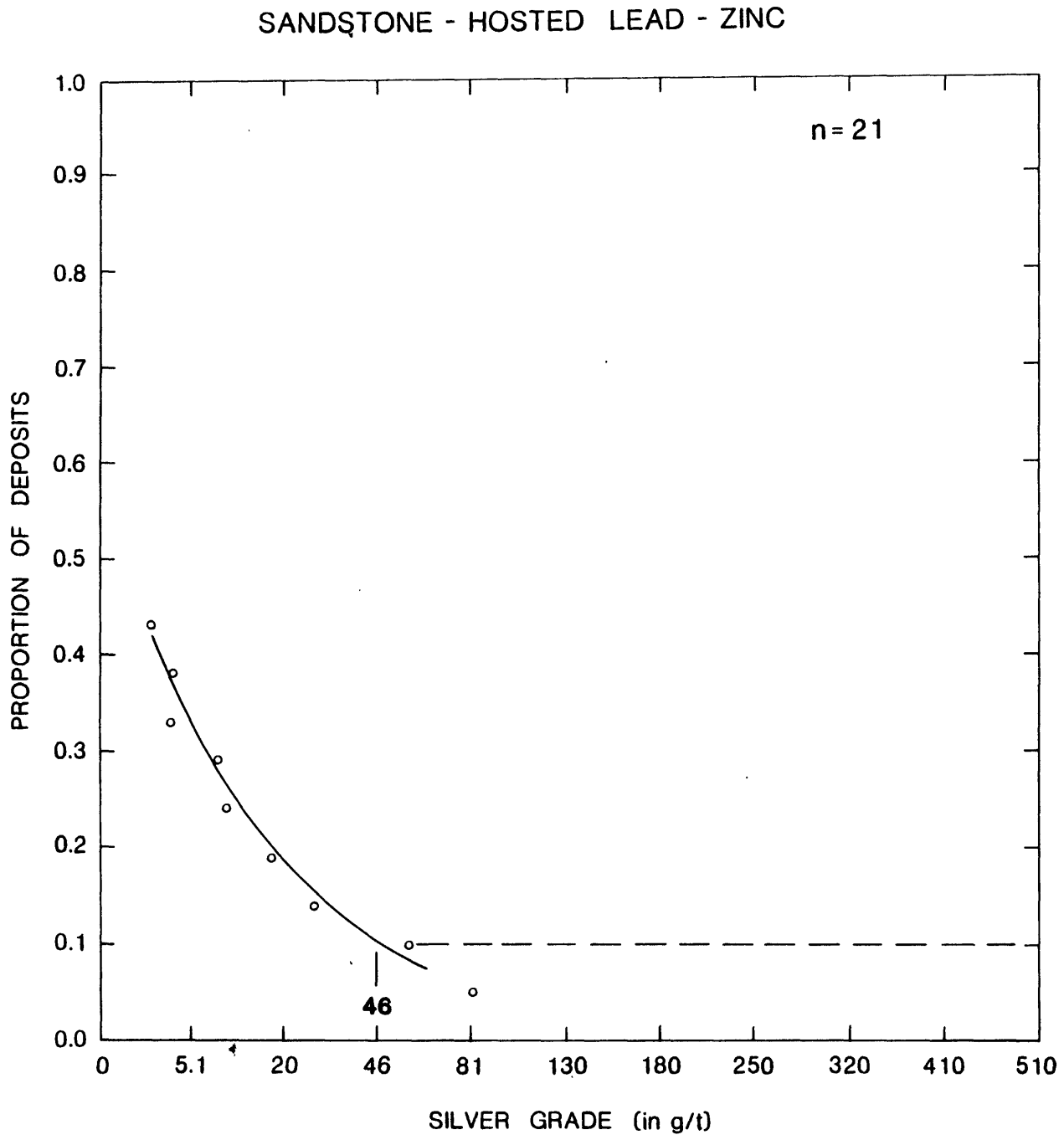
DEPOSITS

Name	Country
Belokany-Laura	URUR
Bou Mia	MRCO
Boylen	CNQU
George Lake	CNSK
Guttusjon	SWDN
Laisvall	SWDN
Largentiere	FRNC
Lovstrand	SWDN
Majva	SWDN
Masua	ITLY
Maubacher	GRMY
Mechernich	GRMY
Oberpfalz	GRMY
Osen	NRWY
Sagliden	SWDN
Shertingdal	NRWY
Smithfield	CNNS
Tregioivo	ITLY
Vassbo	SWDN
Yava (Silvermine)	CNNS
Zeida	MRCO


SANDSTONE - HOSTED LEAD - ZINC
n = 21
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.6
5.5
66
0.0063
0.025
0.1
0.4
1.6
6.3
25
100
400
1600
6300
TONNES (IN MILLIONS)


SANDSTONE - HOSTED LEAD - ZINC
n = 21
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.36
3.4
0.00
0.25
1.00
2.3
4.00
6.3
9.0
12.0
16.0
20.0
25.0
ZINC GRADE (IN PERCENT)


SANDSTONE - HOSTED LEAD - ZINC
n = 21
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1.1
2.6
4.6
0.0
0.12
0.49
1.1
2.0
3.1
4.4
6.0
7.8
9.9
12.0
LEAD GRADE (IN PERCENT)


SANDSTONE - HOSTED LEAD - ZINC
n = 21
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
46
0
5.1
20
46
81
130
180
250
320
410
510
SILVER GRADE (in g/t)

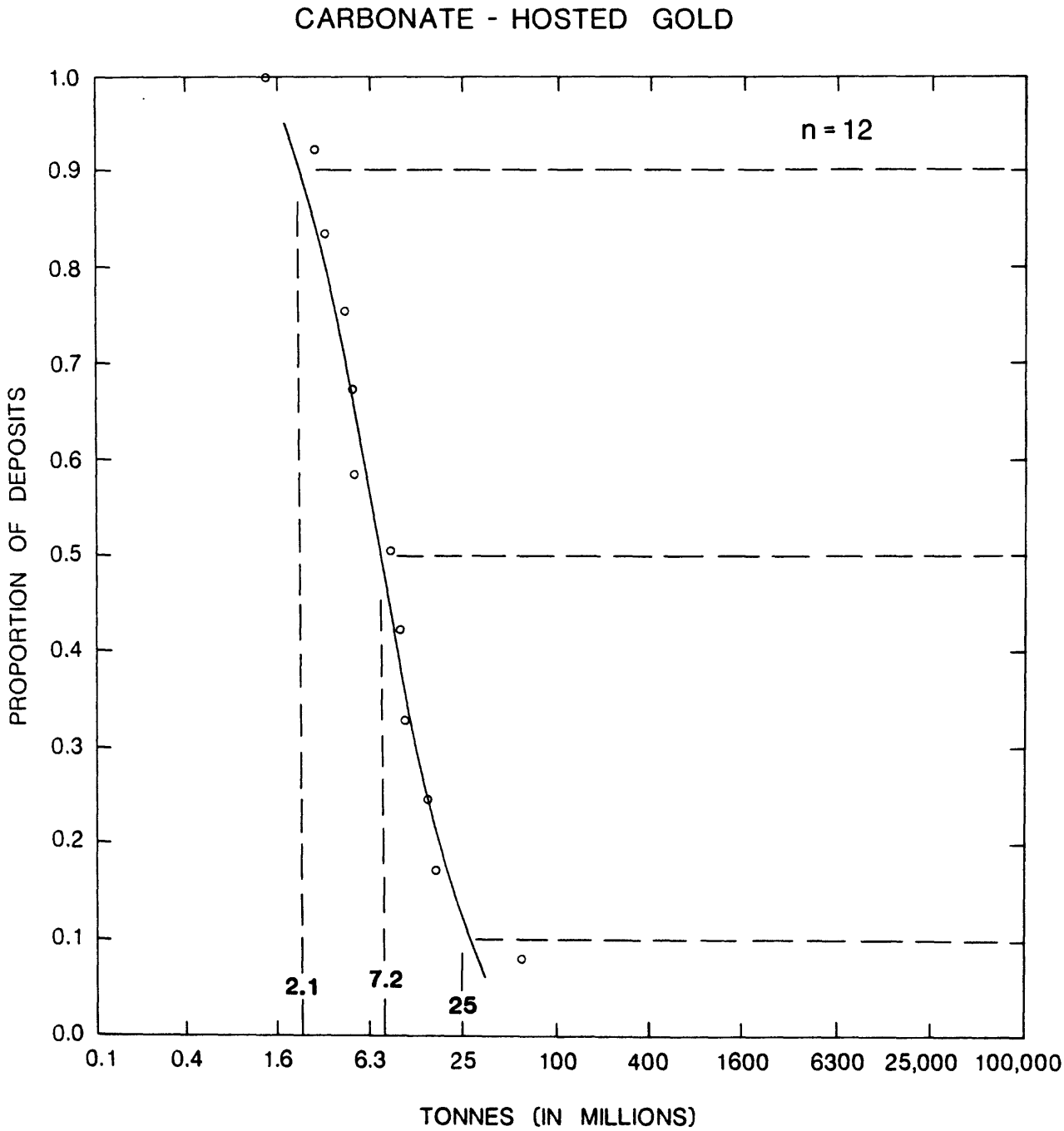
DEPOSIT TYPE Carbonate-hosted gold MODEL NUMBER 5.2

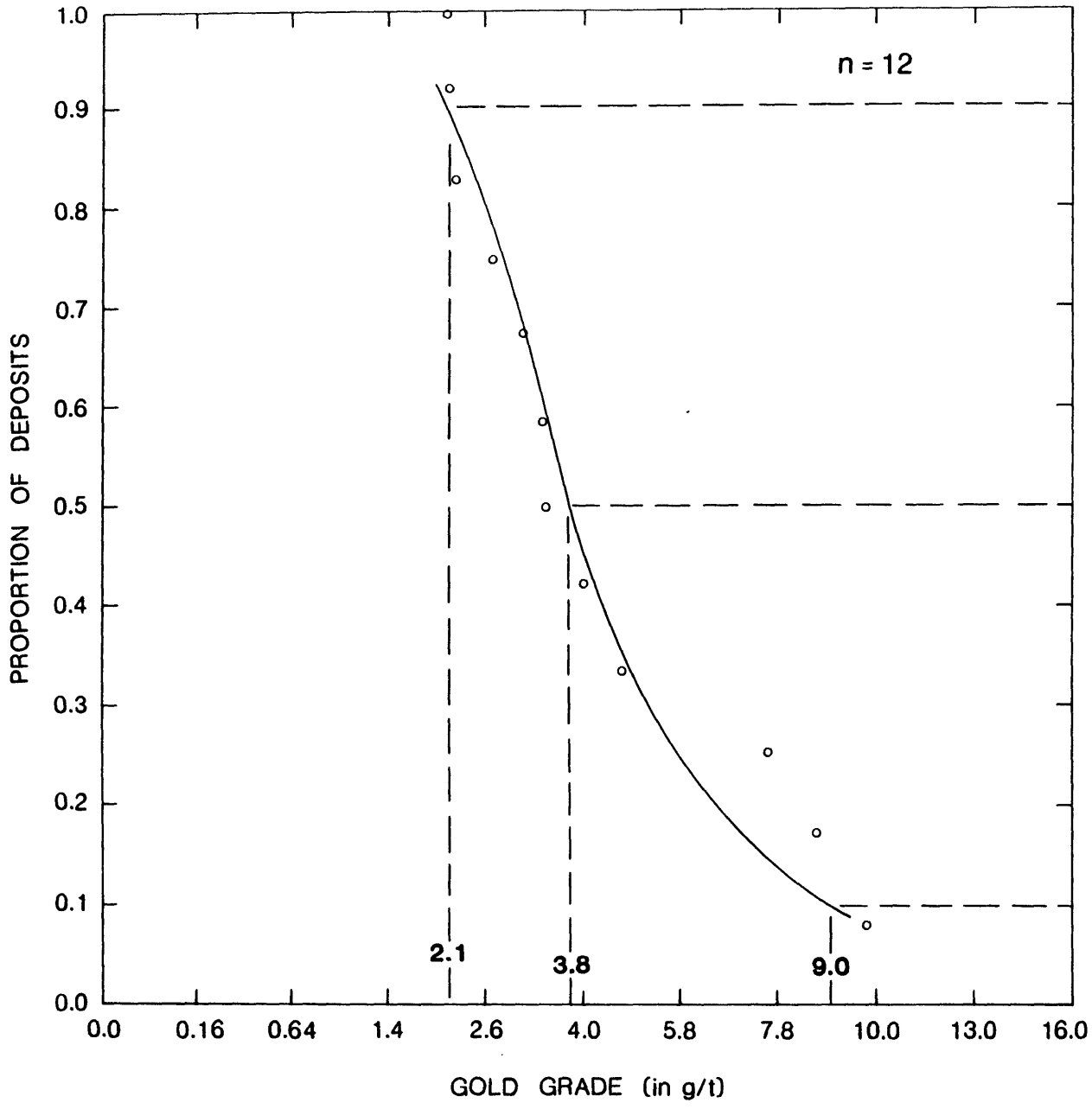
AUTHOR W. D. Menzie, D. L. Mosier, and D. A. Singer

COMMENTS none

DEPOSITS

Name	Country
Alligator Ridge	USNV
Carlin	USNV
Cortez	USNV
Getchell	USNV
Gold Quarry	USNV
Jerritt Canyon	USNV
Maggie Creek	USNV
Mercur	USUT
Northumberland	USNV
Pinson	USNV
Preble	USNV
Santa Fe	USNV


CARBONATE - HOSTED GOLD
n = 12
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2.1
7.2
25
0.1
0.4
1.6
6.3
25
100
400
1600
6300
25,000
100,000
TONNES (IN MILLIONS)


CARBONATE - HOSTED GOLD
n = 12
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2.1
3.8
9.0
0.0
0.16
0.64
1.4
2.6
4.0
5.8
7.8
10.0
13.0
16.0
GOLD GRADE (in g/t)

DEPOSIT TYPE Epithermal gold, quartz-adularia type MODEL NUMBER 5.4

AUTHOR D. L. Mosier and W. D. Menzie

COMMENTS Some of the data represent districts rather than individual deposits. The change in slope of silver grade at 40 g/t suggests the possibility of multiple populations. Lead grade is correlated with zinc grade ($r = 0.83$), gold grade is correlated with silver grade ($r = 0.24$), and gold grade is correlated with tonnage ($r = -0.37$).

DEPOSITS

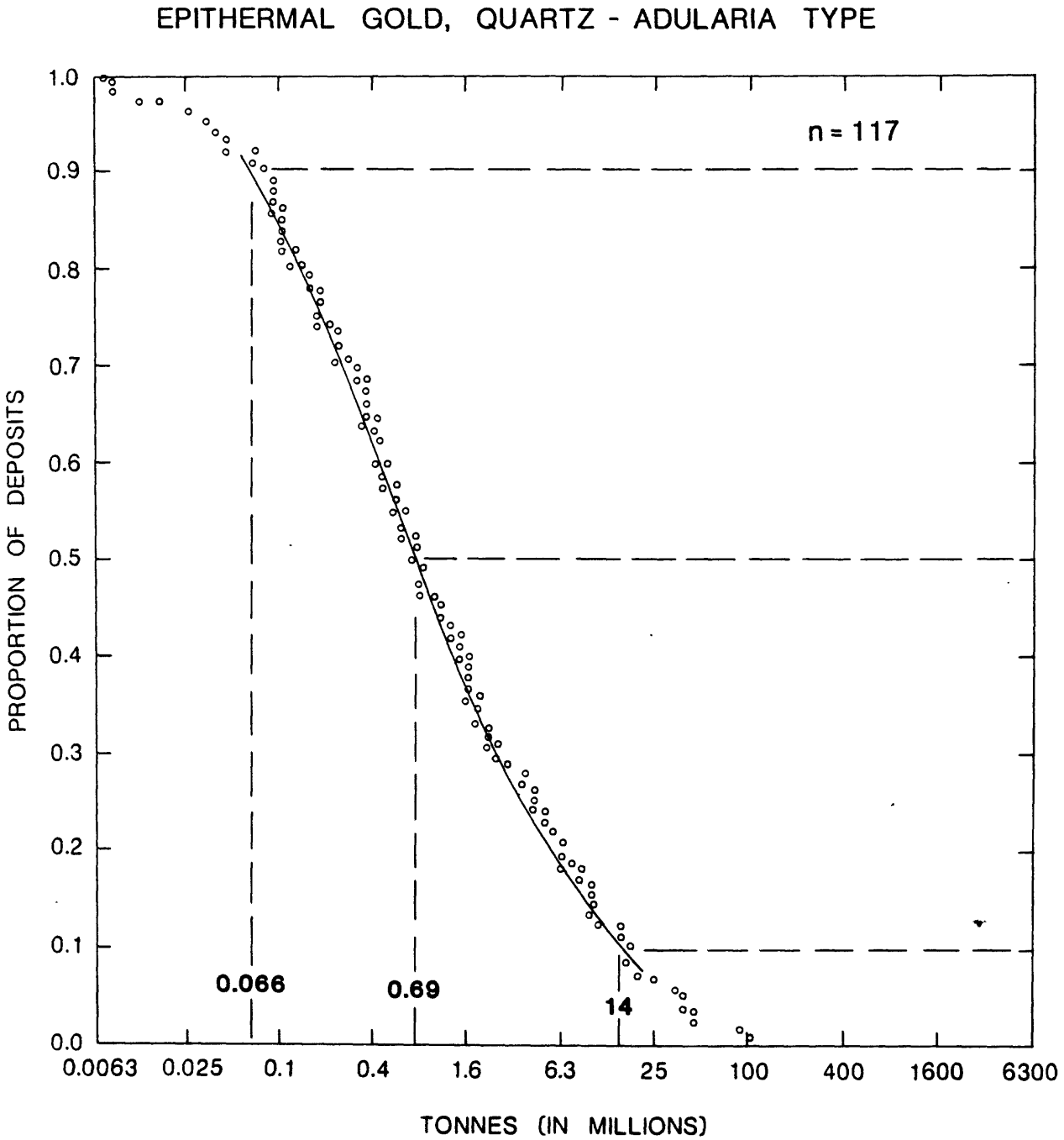
Name	Country	Name	Country
Angangueo	MXCO	Eagle Valley	USNV
Arakawa	JAPN	Eastgate	USNV
Arapdagi-Alurcakoy	TRKY	El Dorado	ELSA
Ashio	JAPN	El Rincon	MXCO
Aurora	USNV	El Tigre	MXCO
Avino	MXCO	Fairview	USNV
Bajo	JAPN	Flathead	USMT
Bellehelen	USNV	Funauchi	JAPN
Blue River	USOR	Gold Circle	USNV
Bodie	USCA	Gold Mountain	USUT
Bolanos	MXCO	Gold Spring	USUT
Bonanza	USCO	Guadalupe y Calvo	MXCO
Bovard	USNV	Guanacevi	MXCO
Bullfrog	USNV	Guanajuato	MXCO
Bruner	USNV	Hata	JAPN
Calistoga	USCA	Hosokura	JAPN
Casapalca	PERU	Hostotipaquilla	MXCO
Cerro de Pasco	PERU	Ikuno	JAPN
Chavin	PERU	Innai	JAPN
Chitose	JAPN	Jarbidge	USNV
Colqui	PERU	Julcani	PERU
Coco Mina	NCRG	Kata	JAPN
Como	USNV	Katherine	USAZ
Comstock	USNV	Kishu	JAPN
Cornucopia	USNV	Kofa	USAZ
Creede	USCO	Konomai	JAPN
Daira	JAPN	Kushikino	JAPN
Divide	USNV	La Libertad	MXCO
Dolores	MXCO	Los Mantiales	AGTN

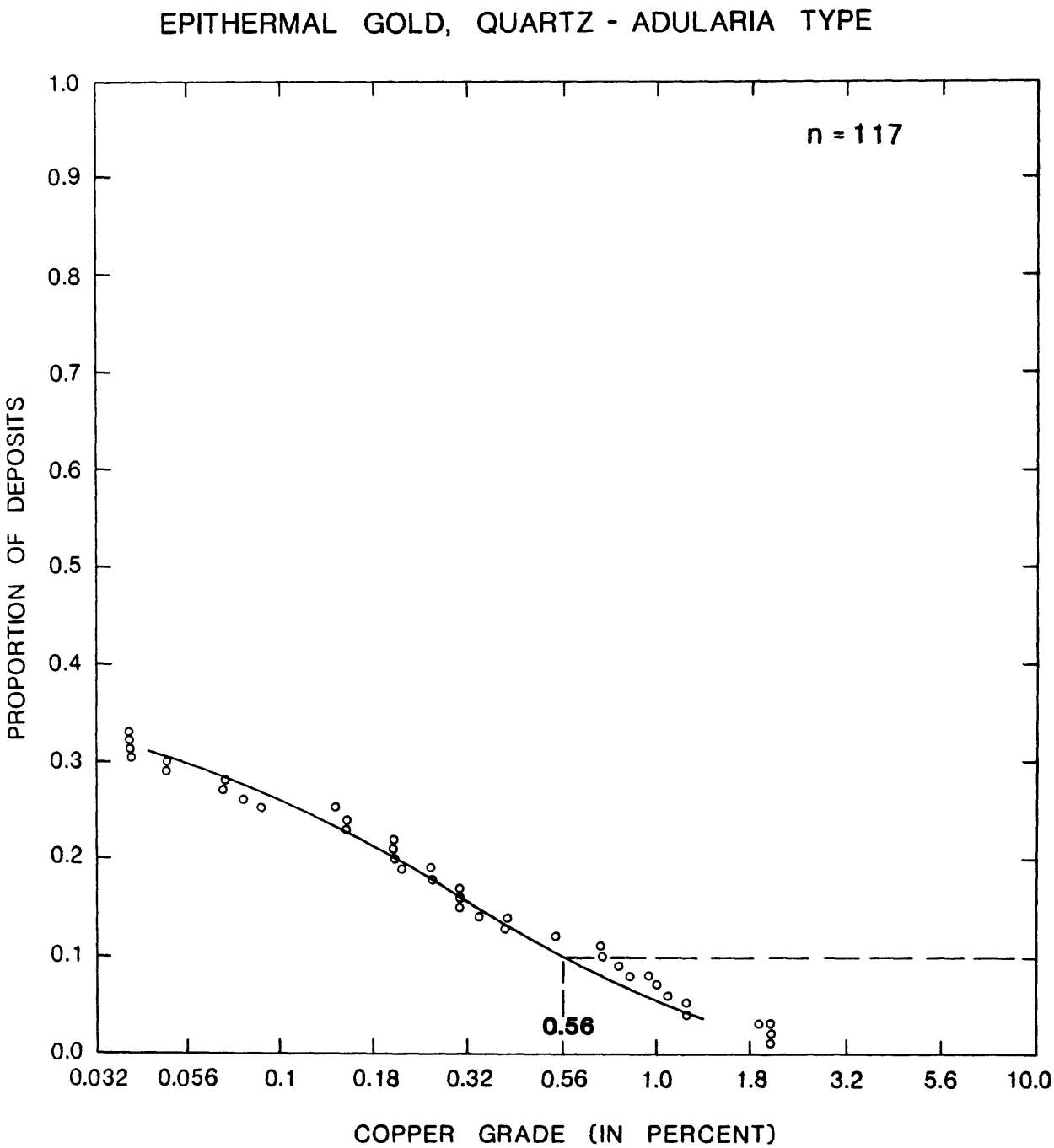
(continued on next page)

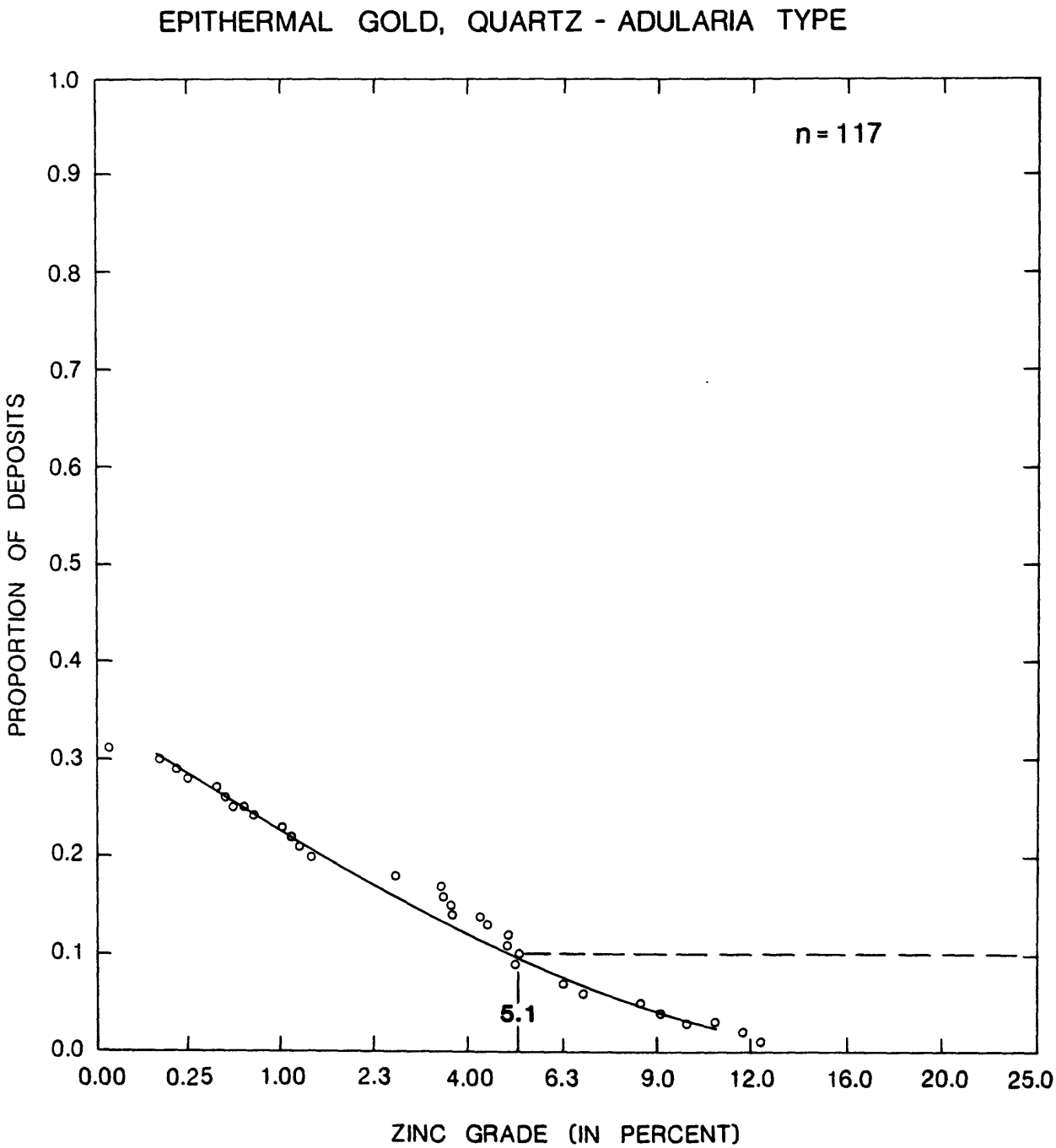
DEPOSIT TYPE Epithermal gold, quartz-adularia type MODEL NUMBER 5.4

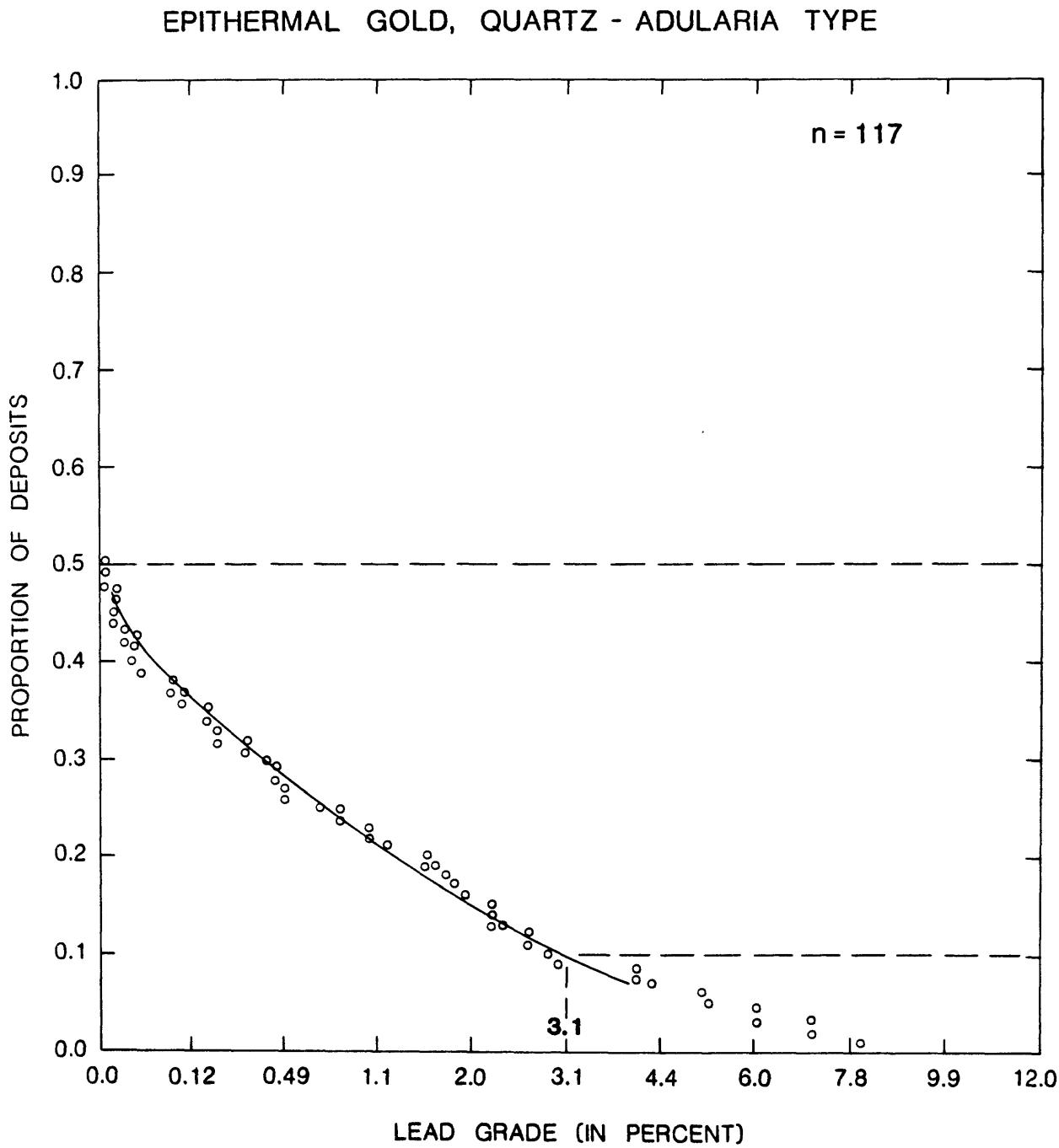
DEPOSITS (continued)

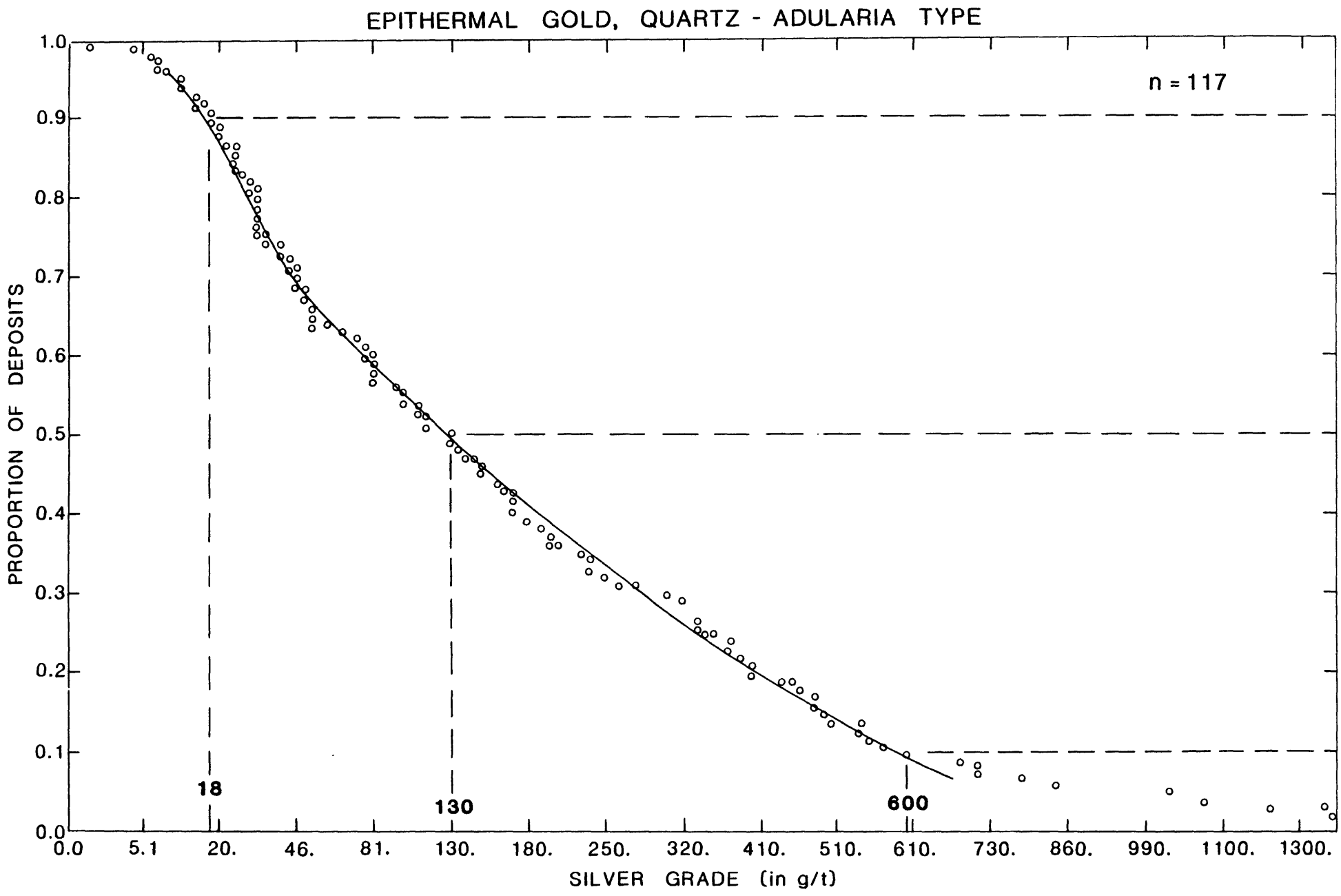
Name	Country	Name	Country
Madrigal	PERU	Sand Springs	USNV
Mikawa	JAPN	Searchlight	USNV
Minamizawa	JAPN	Seikoshi	JAPN
Mizobe	JAPN	Seven Troughs	USNV
Mochikoshi	JAPN	Sheep Tanks	USAZ
Mogollon	USNM	Shizukari	JAPN
Monitor	USCA	Silver City	USNV
Montana Mountain	CNYT	Stateline	USUT
Mount Nansen	CNYT	Steeple Rock	USNM
Nagamatsu	JAPN	Taio	JAPN
National	USNV	Taisei	JAPN
Nawaji	JAPN	Takatama	JAPN
Neves Corvo	PERU	Tambo Grande	PERU
Nogal	USNM	Tayolita	MXCO
Numanoue	JAPN	Telluride	USCO
Oatman	USNV	Todoroki	JAPN
Odomori	JAPN	Toi	JAPN
Ogane	JAPN	Tokusei	JAPN
Ohito	JAPN	Tonopah	USNV
Oizumi	JAPN	Topia	MXCO
Osarizawa	JAPN	Toyoha	JAPN
Otaez	MXCO	Tuscarora	USNV
Pacheco-Real del Monte	MXCO	Unga	USAK
Provenir	PERU	Urauchic	MXCO
Pueblo Viejo	DMRP	Waihi	NZLD
Rawhide	USNV	Wonder	USNV
Republic	USWA	Yoquivo	MXCO
Rio Pallanga	PERU	Yugashima	JAPN
Rosario	HNDR	Zeh Abad	IRAN
Sado	JAPN		

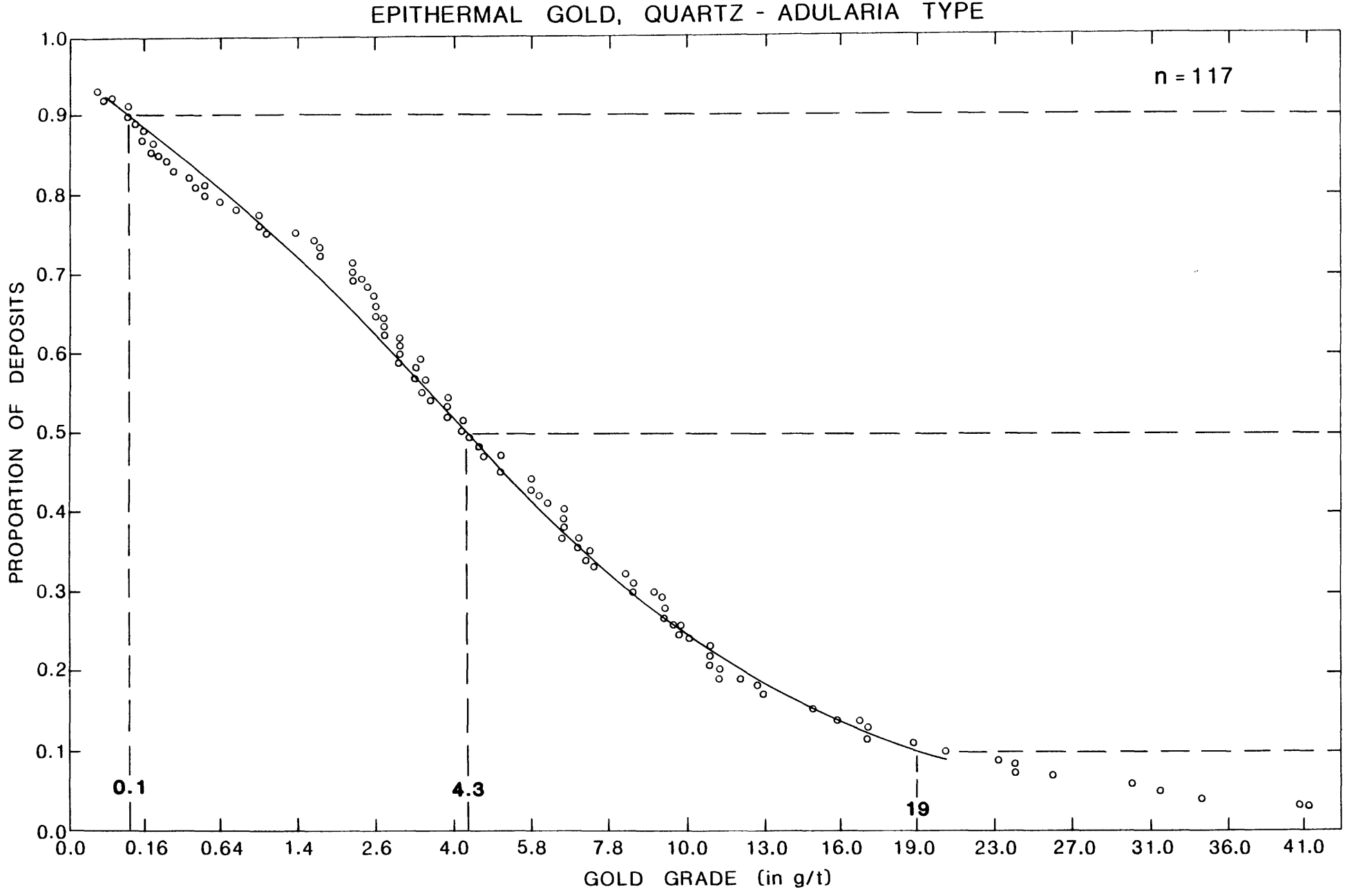

EPITHERMAL GOLD, QUARTZ - ADULARIA TYPE
n = 117
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.066
0.69
14
0.0063
0.025
0.1
0.4
1.6
6.3
25
100
400
1600
6300
TONNES (IN MILLIONS)


EPITHERMAL GOLD, QUARTZ - ADULARIA TYPE
n = 117
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.56
0.032
0.056
0.1
0.18
0.32
0.56
1.0
1.8
3.2
5.6
10.0
COPPER GRADE (IN PERCENT)


EPITHERMAL GOLD, QUARTZ - ADULARIA TYPE
n = 117
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
5.1
0.00
0.25
1.00
2.3
4.00
6.3
9.0
12.0
16.0
20.0
25.0
ZINC GRADE (IN PERCENT)


EPITHERMAL GOLD, QUARTZ - ADULARIA TYPE
n = 117
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.12
0.49
1.1
2.0
3.1
4.4
6.0
7.8
9.9
12.0
3.1
LEAD GRADE (IN PERCENT)


EPITHERMAL GOLD, QUARTZ - ADULARIA TYPE
n = 117
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
18
130
600
0.0
5.1
20.
46.
81.
130.
180.
250.
320.
410.
510.
610.
730.
860.
990.
1100.
1300.
SILVER GRADE (in g/t)


EPITHERMAL GOLD, QUARTZ - ADULARIA TYPE
n = 117
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.1
4.3
19
0.0
0.16
0.64
1.4
2.6
4.0
5.8
7.8
10.0
13.0
16.0
19.0
23.0
27.0
31.0
36.0
41.0
GOLD GRADE (in g/t)

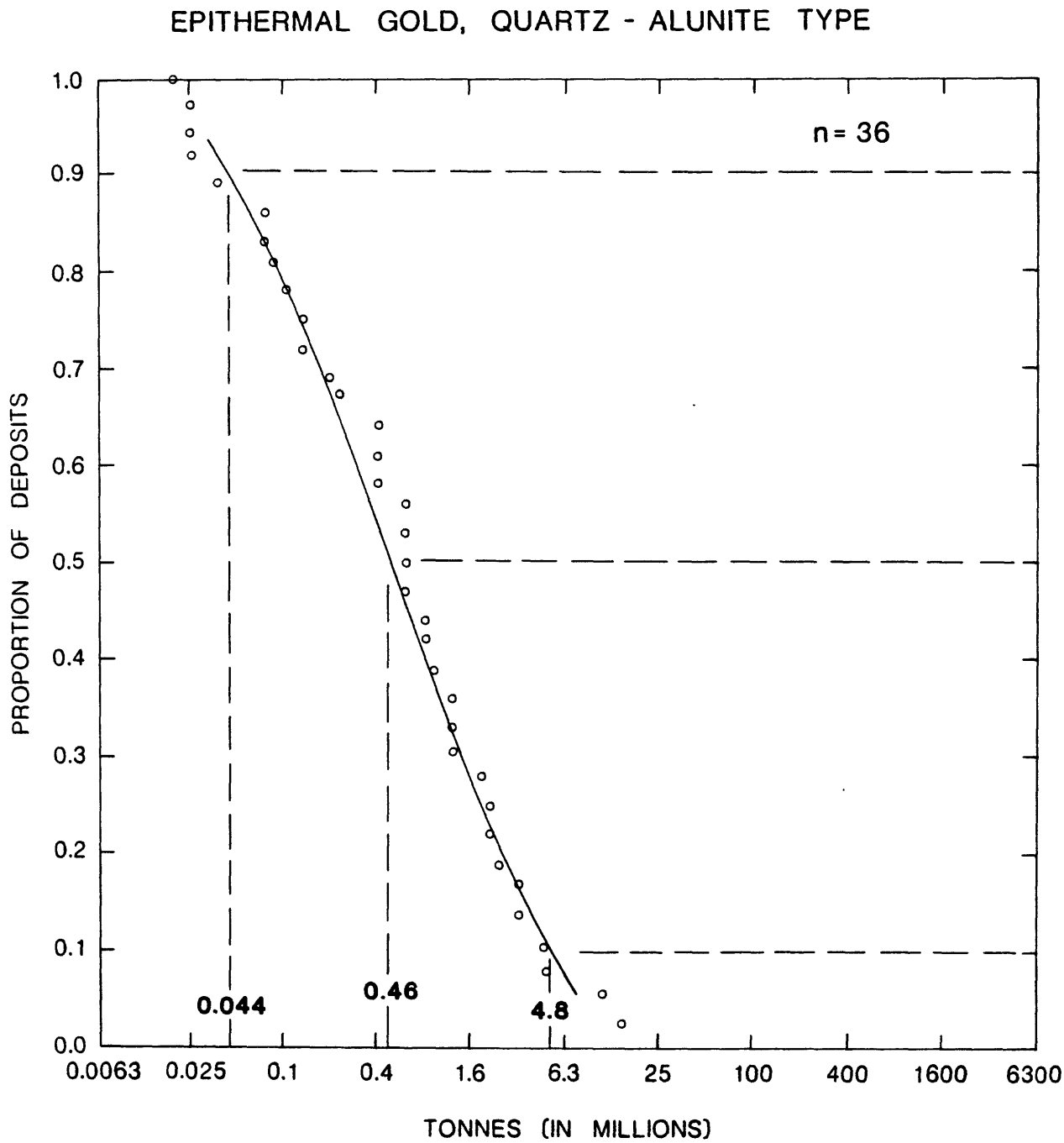
DEPOSIT TYPE Epithermal gold, quartz-alunite type MODEL NUMBER 5.5

AUTHOR D. L. Mosier and W. D. Menzie

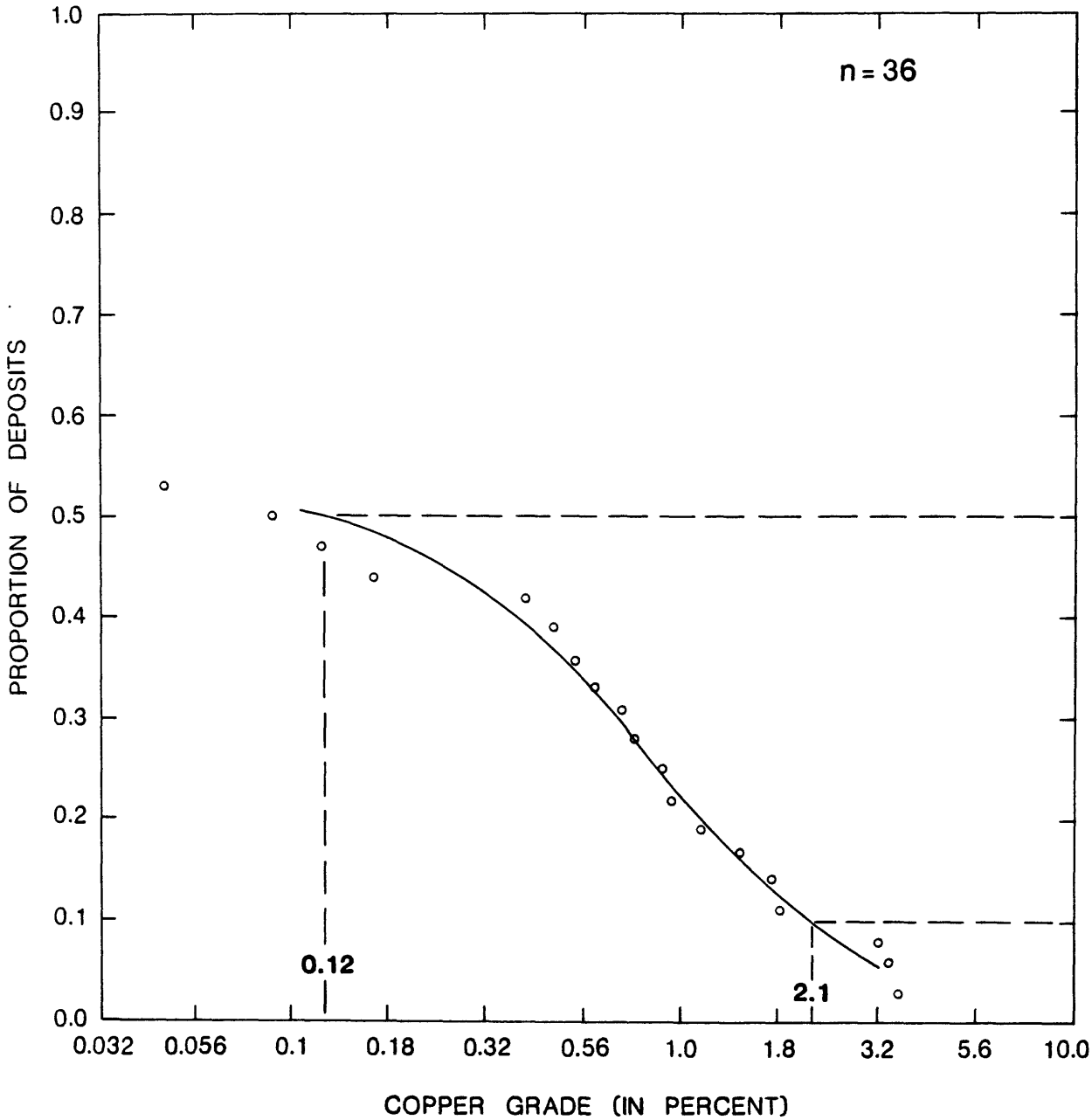
COMMENTS none

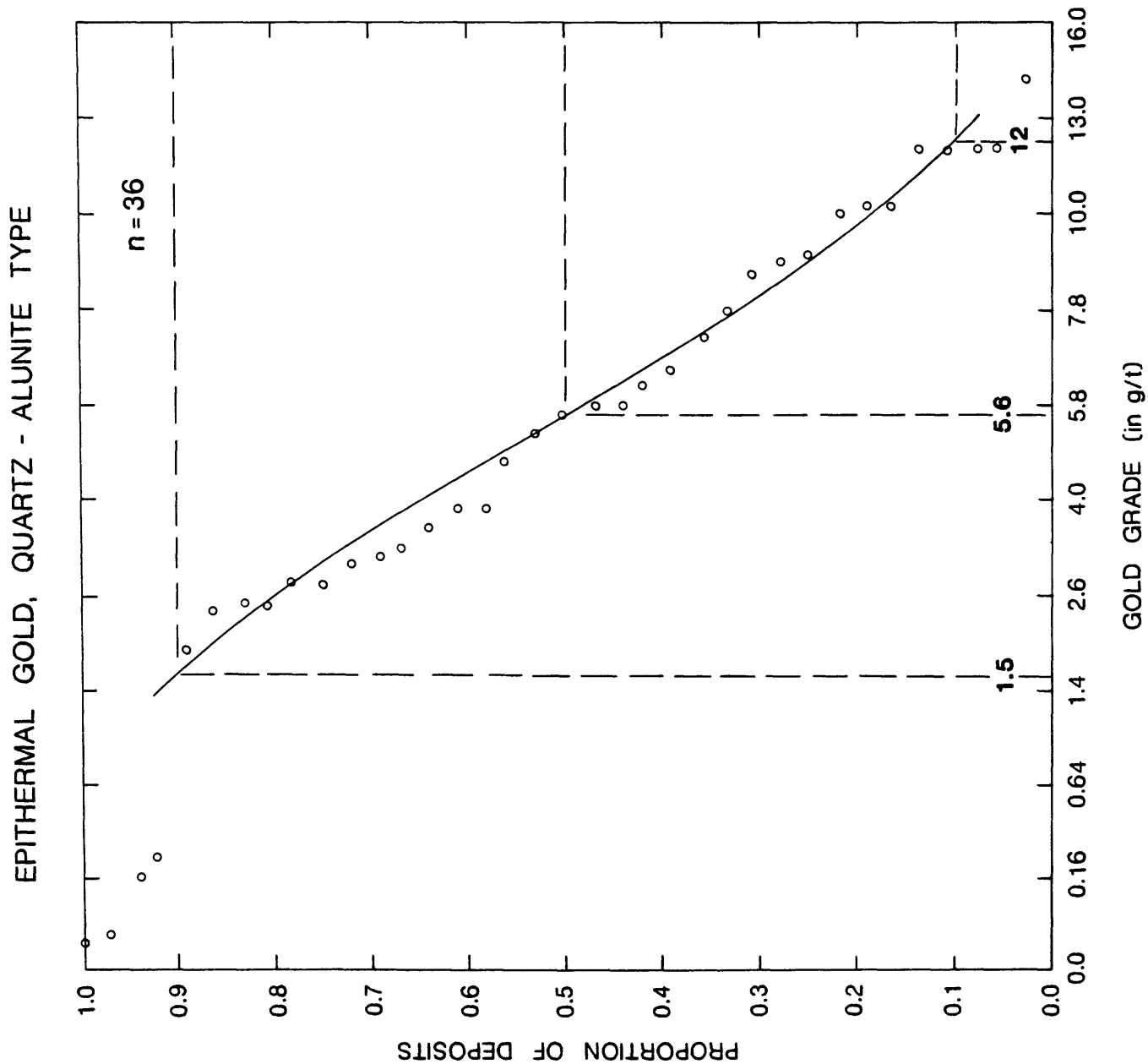
DEPOSITS

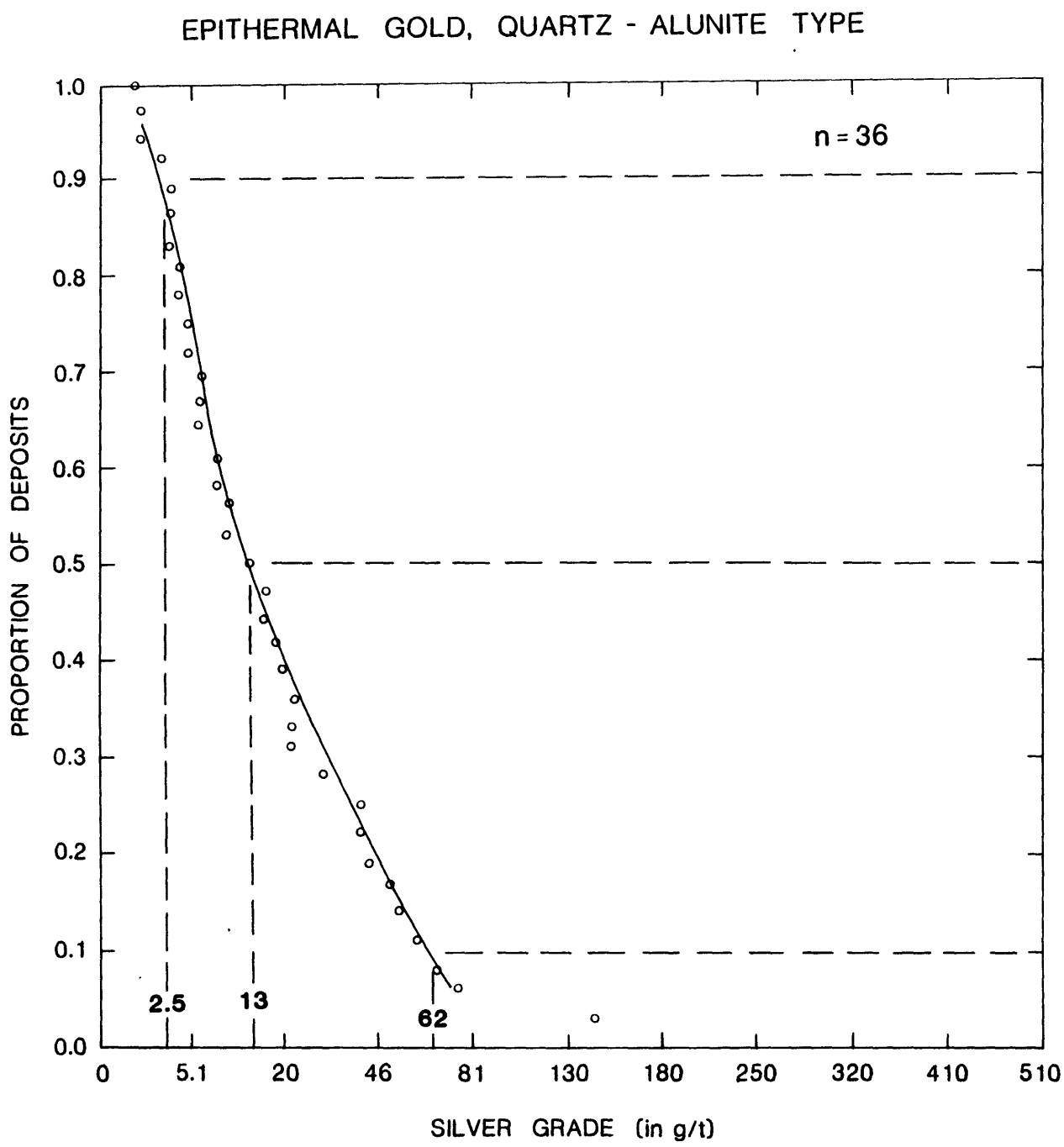
Name	Country
Akabane	JAPN
Akaishi	JAPN
Ani	JAPN
Benten	JAPN
Borealis	JAPN
Chinkuashin	TIWN
El Indio	CILE
Eniwa	JAPN
Fuke	JAPN
Furokura	JAPN
Goldfield	USNV
Yiyama	JAPN
Hokuryu	JAPN
Iwato	JAPN
Kasuga	JAPN
Kawaski	JAPN
Kitanoo	JAPN
Kushikino-Hajima	JAPN
Kushikino-Otani	JAPN
Mamuro	JAPN
Masbate	JAPN
Masonic	USCA
Mohave	USCA
Nikko	JAPN
Oguchi	JAPN
Okinoura	JAPN
Okuzu	JAPN
Orient	JAPN
Sanei	JAPN
Sanru	JAPN
Stedman	USCA
Takahata	JAPN
Takeno	JAPN
Teine	JAPN
Tomisu	JAPN
Tozawa	JAPN


EPITHERMAL GOLD, QUARTZ - ALUNITE TYPE
n = 36
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.044
0.46
4.8
0.0063
0.025
0.1
0.4
1.6
6.3
25
100
400
1600
6300
TONNES (IN MILLIONS)

EPITHERMAL GOLD, QUARTZ - ALUNITE TYPE




EPITHERMAL GOLD, QUARTZ - ALUNITE TYPE
n = 36
1.5
5.6
12
PROPORTION OF DEPOSITS
GOLD GRADE (in g/t)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.16
0.64
1.4
2.6
4.0
5.8
7.8
10.0
13.0
16.0


EPITHERMAL GOLD, QUARTZ - ALUNITE TYPE
n = 36
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2.5
13
62
0
5.1
20
46
81
130
180
250
320
410
510
SILVER GRADE (in g/t)

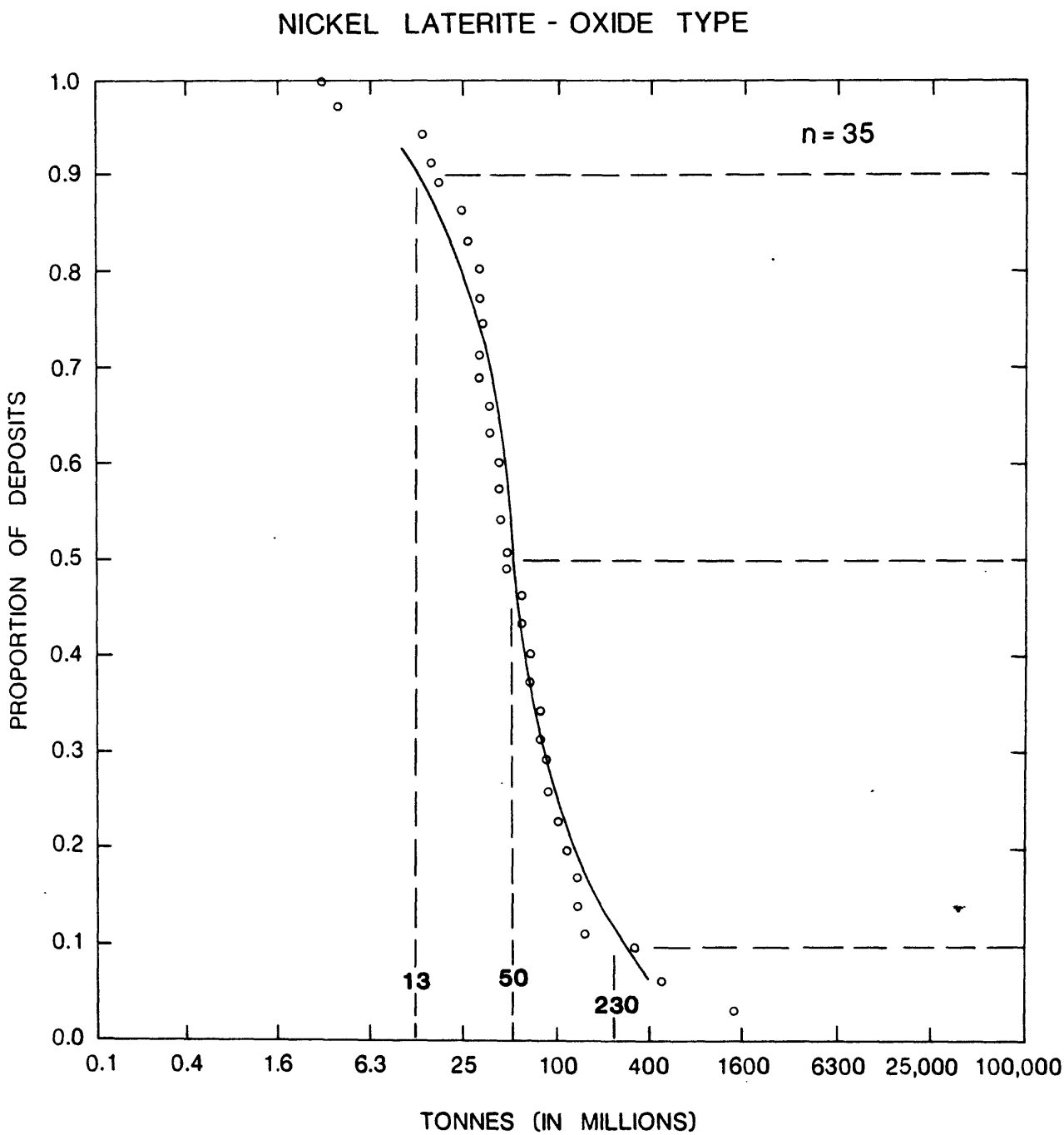
DEPOSIT TYPE Nickel laterite--oxide type MODEL NUMBER none

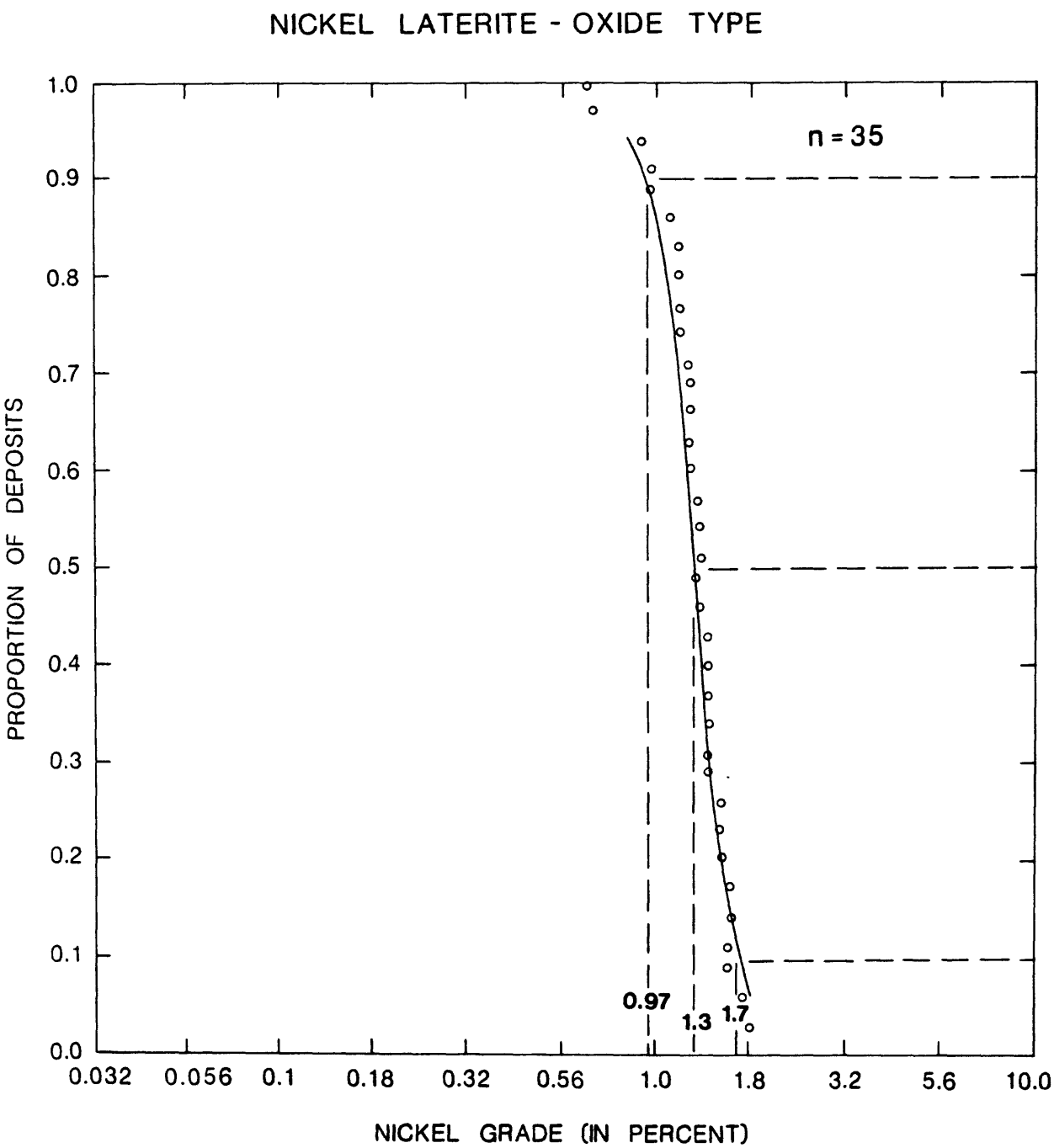
AUTHOR D. A. Singer

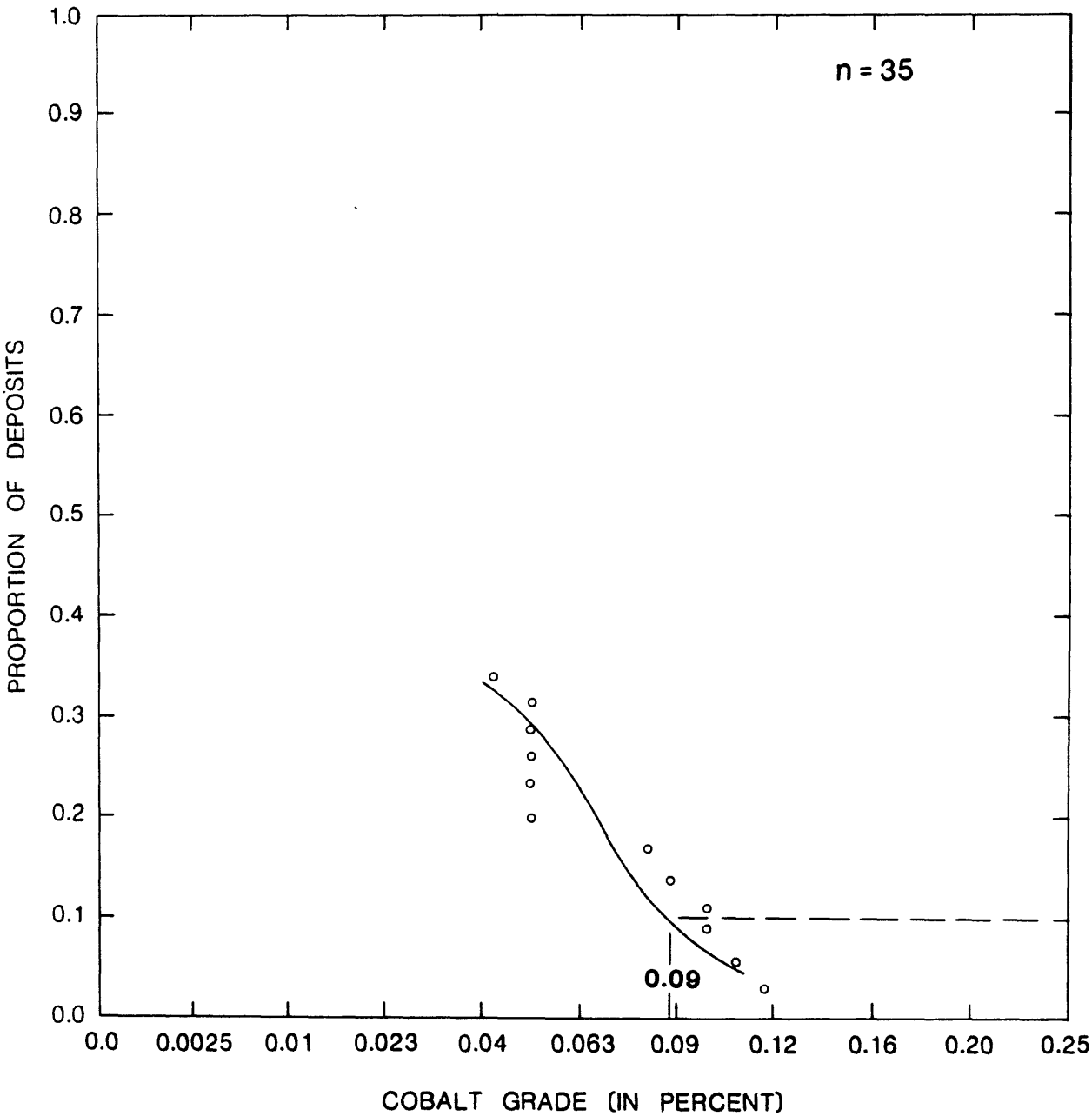
COMMENTS Nickel laterite is soil formed in warm humid climates by chemical breakdown of ultramafic rocks. Oxide laterite forms where there is incomplete separation of the nickel and most of the nickel occurs with iron. Tonnage is significantly correlated with nickel grade at the 5-percent level ($r = -0.37$). Grades for the 23 deposits without reported cobalt grades are probably similar to those with reported grades.

DEPOSITS

Name	Country
Ambatory	MDGS
Analamay	MDGS
Barro Alto	BRZL
Berong	PLPN
Cerro Matoso	CLBA
Cyclops	INDS
Dinaget Island	PLPN
Falconbridge	DMRP
Gag Island	INDS
Greenvale	AUQL
Halmahera	INDS
Ipaneme	BRZL
Jacupuenga	BRZL
Laguney	PLPN
Leviso River	CUBA
Loma de Hierro	VNZL
Long Point	PLPN
Marlborough	AUQL
Minas Gerais	BRZL
Moorsom	PLPN
Moramanya	MDGS
Morro de Engenho	BRZL
Nonoc	PLPN
Obi	INDS
Ora Banda	AUWA
Pomaloa	INDS
Ramona-Loma	CUBA
Riddle	USOR
Rio Tuba	PLPN
Sablayon	PLPN
Sao Joav do Piaui	BRZL
S. E. Kalimantan	INDS
Sukinda	INDA
Surigao	PLPN
Wingelinna-Daisy Bates	AUWA


NICKEL LATERITE - OXIDE TYPE
n = 35
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
13
50
230
0.1
0.4
1.6
6.3
25
100
400
1600
6300
25,000
100,000
TONNES (IN MILLIONS)


NICKEL LATERITE - OXIDE TYPE
n = 35
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.032
0.056
0.1
0.18
0.32
0.56
1.0
1.8
3.2
5.6
10.0
0.97
1.3
1.7
NICKEL GRADE (IN PERCENT)


NICKEL LATERITE - OXIDE TYPE
n = 35
PROPORTION OF DEPOSITS
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.09
0.0
0.0025
0.01
0.023
0.04
0.063
0.09
0.12
0.16
0.20
0.25
COBALT GRADE (IN PERCENT)

COUNTRY NAMES

AGTN	Argentina
ALGR	Algeria
AUNS	Australia, New South Wales
AUNT	Australia, N. Territory
AUQL	Australia, Queensland
AUTS	Australia, Tasmania
AUWA	Australia, Western Australia
BULG	Bulgaria
BRMA	Burma
BRZL	Brazil
CILE	Chile
CINA	China
CLBA	Colombia
CNBC	Canada, British Columbia
CNMN	Canada, Manitoba
CNNB	Canada, New Brunswick
CNNF	Canada, Newfoundland
CNNS	Canada, Nova Scotia
CNNT	Canada, Northwest Territory
CNON	Canada, Ontario
CNQU	Canada, Quebec
CNSK	Canada, Saskatchewan
CNYT	Canada, Yukon Territory
CUBA	Cuba
CYPS	Cyprus
CZCL	Czechoslovakia
DMRP	Dominican Republic
ECDR	Ecuador
ELSA	El Salvador
FIJI	Fiji
FNLD	Finland
FRNC	France
GRBR	Great Britain
GREC	Greece
GRLD	Greenland
GRMY	Germany
GUAT	Guatemala
HATI	Haiti
HONG	Hong Kong
HNDR	Honduras
HUNG	Hungary
INDA	India
INDS	Indonesia
IRAN	Iran
IRLD	Ireland
ITLY	Italy
JAPN	Japan
MDGS	Madagascar
MRCO	Morocco
MXCO	Mexico
NCRG	Nicaragua
NRWY	Norway
NZLD	New Zealand
OMAN	Oman
PANA	Panama
PERU	Peru
PKTN	Pakistan
PLPN	Philippines
PORT	Portugal
PPNG	Papua New Guinea
PTRC	Puerto Rico
RMNA	Romania
SAAR	Saudi Arabia
SAFR	South Africa
SKOR	South Korea
SPAN	Spain
SWDN	Sweden
THLD	Thailand
TIWN	Taiwan
TRKY	Turkey
URAM	USSR, Armenia
URKZ	USSR, Kazakhstan
URTD	USSR, Tadzhilistan
URUR	USSR, Russian Rep.
URUZ	USSR, Uzbekistan
USAK	US, Alaska
USAZ	US, Arizona
USCA	US, California
USCO	US, Colorado
USGA	US, Georgia
USID	US, Idaho
USME	US, Maine
USMS	US, Massechusetts
USMT	US, Montana
USNM	US, New Mexico
USNV	US, Nevada
USOR	US, Oregon
USUT	US, Utah
USWA	US, Washington
USWI	US, Wisconsin
USWY	US, Wyoming
VNZL	Venezuela
YUGO	Yugoslavia

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