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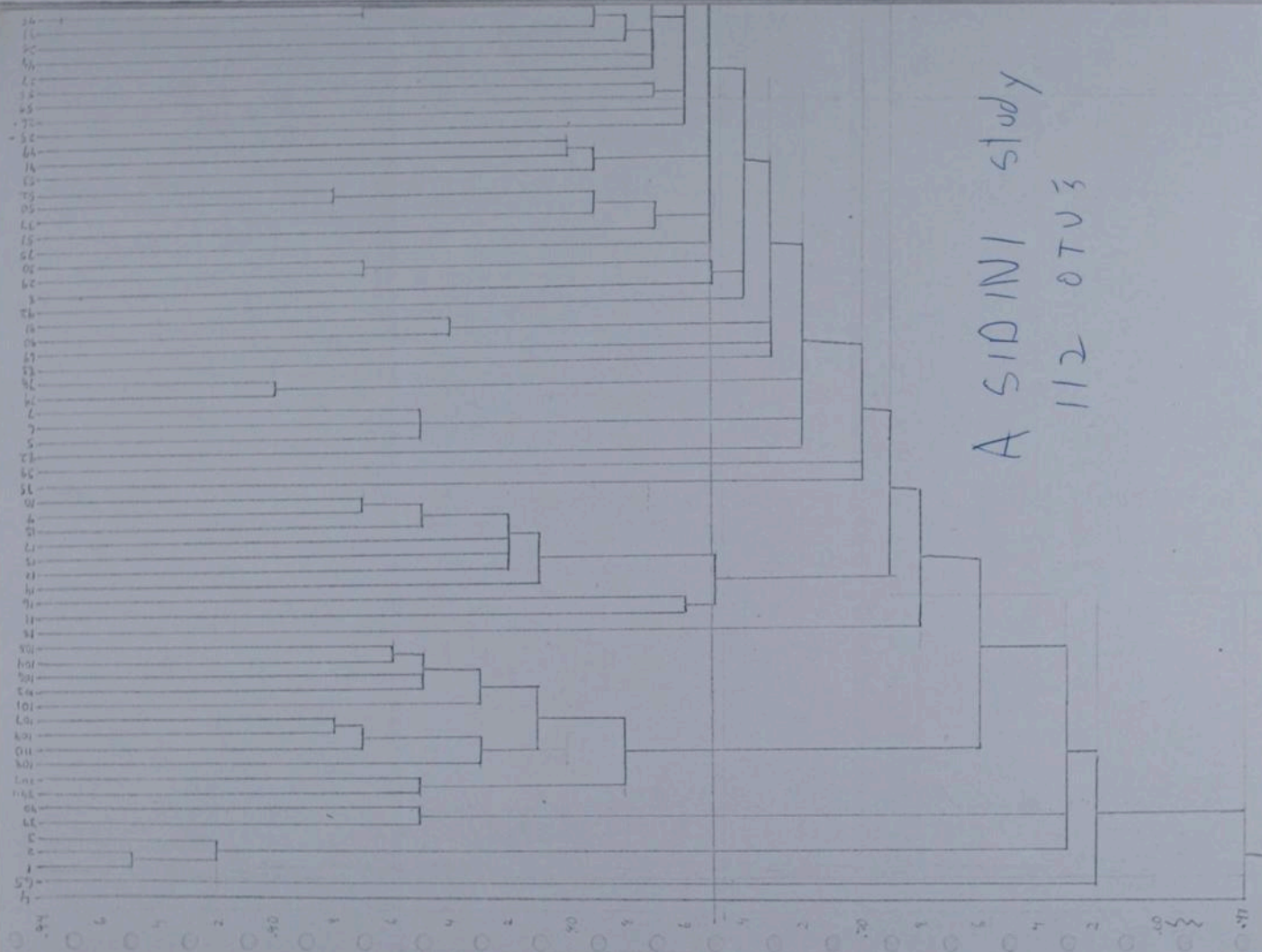
About the Institute

The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

NOTE: charges to Kenley Bottom
as of 25 Oct 68:

CP	5.00
FD	2.60
	7.60
mailing	1.07



STOP

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21 March 1969

INVOICE UNIVERSITY OF COLORADO

University of California, Riverside
Entomology NDEA 5-400330-23405-3

(Ketty W. Brown)

☐ PURCHASING
OPERATIONS☐ FOOD☐ LAUNDRY☐ OTHER (EXPLAIN)☐ LINEN☐ BOOK STORE☐ PHYSICAL
PLANT☐ ALCOHOL☐ PHARMACY☐ PRINTING
SERVICES☐ MOTOR
POOLACCT. NO. OF DEPT.
RENDERING SERVICES

DEPARTMENT

NUMBER

SUB

BUD. CODE

OBJECT CLASS

1708

48

IN 31282

QUANTITY	DESCRIPTION	UNITS ISSUED	UNIT PRICE	AMOUNT
	Central Processing Time			20.00
	Peripheral " "			6.70
2	Plots (+ PP Time)			10.00
	Handling Fee			10.00
	Consulting Fee			20.00
	Mailing Charges			3.24

DELIVER TO

Taximetrics Laboratory (David J. Rogers)

ADDRESS

University of Colorado (Armory 101)
Boulder, Colorado 80302

TOTAL

\$69.94

REQUESTED BY

EXTENSION

DATE

CHARGE ACCOUNT

TO:

Inter-Office Snap Set

FROM:

John W. Wong, Jr.
Department of Biology
Armory 101
University of Colorado
Boulder, Colorado

UNIVERSITY OF CALIFORNIA, RIVERSIDE

U. L. Riggs

Entomology

SUBJECT

DATE

Computer Charges - Kirby W. Brown

3-17-69

MESSAGE

We believe previous charges were written up on a recharge form and mailed to us from your Department. We would appreciate the same procedure this time for the \$69.94 billed on March 6, 1969. It is very difficult for us to pay for these types of charges in any other way.

SIGNED

U. L. Riggs

REPLY

DATE

REPLY TO

SIGNED

20-11

THIS COPY RETURNED TO SENDER

B

UNIVERSITY OF COLORADO
BOULDER, COLORADO 80302

PHONE: 303-443-2211
Ext. 6712

TAXIMETRICS LABORATORY
DEPARTMENT OF BIOLOGY
ARMORY 101

6 March 1969

Kirby W. Brown
Entomology NDEA 5-400330-23405-3

Central Processing Time	\$20.00
Peripheral " Time	6.70
2 Plots (+ PP Time)	10.00
Handling Fee	10.00
Consulting Fee	20.00
Mailing Charges	3.24
	\$69.94

Please make check to The Taximetrics Laboratory.

7 March 1969

Mr. Kirby Brown
Department of Entomology
College of Biological and Agricultural Sciences
University of California
Riverside, Calif. 92502

Dear Kirby:

We have sent you your three data decks and the three corresponding graph print outs, via first class mail. In a separate manila envelope are the two plots of the Gonsida study. Unfortunately, as we are still in the process of debugging the current operating system, in order to produce the Asidini plot we would have had to run the total graph package again. This, you will agree, would be too expensive. We are sorry for the delay; however, as you can imagine pre-funding months are hectic.

Attached is the list of our charges.

Sincerely,

John W. Wong, Jr.
Programmer

JWW:gm

UNIVERSITY OF COLORADO
BOULDER, COLORADO 80302

TAXIMETRICS LABORATORY
DEPARTMENT OF BIOLOGY
ARMORY 101

PHONE: 303-443-2211
Ext. 6712

6 March 1969

Kirby W. Brown
Entomology NDEA 5-400330-23405-3

Central Processing Time	\$20.00
Peripheral " Time	6.70
2 Plots (+ PP Time)	10.00
Handling Fee	10.00
Consulting Fee	20.00
Mailing Charges	3.24
	\$69.94

Please make check to The Taximetrics Laboratory.

UNIVERSITY OF CALIFORNIA, RIVERSIDE

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO



SANTA BARBARA • SANTA CRUZ

COLLEGE OF BIOLOGICAL
AND AGRICULTURAL SCIENCES
CITRUS RESEARCH CENTER AND
AGRICULTURAL EXPERIMENT STATION
DEPARTMENT OF ENTOMOLOGY

RIVERSIDE, CALIFORNIA 92502

February 15, 1969

Dr. David J. Rogers
Taximetrics Laboratory
Dept. of Biology
Armory 101
University of Colorado
Boulder, Colorado 80302

Dear Dr. Rogers:

Received your letter of Feb. 10 and I'm surely sorry to hear of your money problems. It seems to be happening everywhere, with radical students trying to tear down universities from one end, and polititions cutting budgets at the other things are getting rough. Also I have heard complaints at our computer center that half the jobs run don't get paid for and can imagine you are having similar problems.

So hope I am not adding too much to your problems by sending another job. This should be the last for awhile anyway. I have airmailed off a packet of cards for a study of all the genera of North American Asidini. There are 112 otu's scored for 24 characters. Enclosed is a copy of the illustrated guide I used. They are all well ordered type on purpose so I could analize frequencies of states after the clustering helps figure things out. Also you will notice that I avoided dorsal characters since they seem to be often convergent and influenced by mimicry, especially at the generic level. Here again is a case where I tried to figure out the genera by compairing specimens and drawings of details in the usual way. I got completely bogged down and decided to give the computer a crack at it. There are now around 25 genera and 250 species (the 112 otu's sent represent most of what I think are valid species, each otu is a single species scored from several specimens). Many of the genera are hodge-podges. I think there are actually less than 10 genera. I really think your program will be a great help.

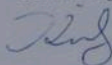
If you haven't run the 2 *Gonasida* studies yet, please do the Asidini study first as it has first priority. Once I figure out the genera I can determine the specimens I have and return to the many museums. I have definately accepted the job in Honduras with Standard Fruit Co. (looks like I'll be a banana doctor for awhile) and will be leaving Riverside late in March so hope it will be possible at least to get the Asidini study through soon. I sincerely hope this does not add too much to your troubles. You have already done so much for me and I greatly

Feb. 15, 1969

appreciate it. The least I can do is urge you to be sure to charge my account for all expenses associated with running my studies. I don't mean just computer time, but time spent handling and setting up the cards, packing and mailing printouts (please air mail results), and a "consultation fee" if such is possible. I believe this is just and fair and I would be most happy if you could at least recoup financially for the efforts you have most kindly done for me. Since I will be leaving late March I will be in the unusual position of having a surplus in my NDEA money which will simply revert back to the campus general fund if not expended.

You might be interested to know that there is a large IEM 360 computer installation in Standard Fruit's operation at La Ceiba, Honduras. They claim it is the largest in Central America and I believe it since it is almost twice the size of the installation here at UCR. Anyway I hope to continue on my own to learn programming and hopefully continuing experimenting with computer taxonomy. I am very interested in seeing your program redone for the 360. Also Dr. Schlinger is very interested in this. Already 4 of his grad. students are interested (including myself). Also he is keen on having it available so students in the Systematic Entomology class could work with it and become exposed to modern methods.

Sincerely,



Kirby W. Brown

P.S. It seems I forgot to include the 99999 card to end the data decks on the Goniasida studies. In the card set just sent I included an extra one, tho probably you just punched some new ones.

Enclosure.

1. ANTENNA - seg. 9 - sense areas



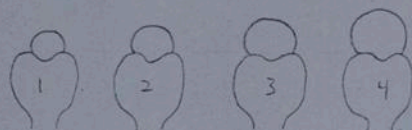
2. ANTENNA - seg. 10 - sense areas



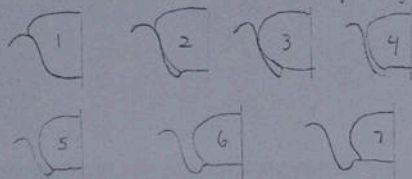
3. ANTENNA - shape of 9



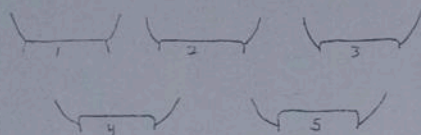
4. ANTENNA - seg. 10 size



5. MENTUM - separation from post-gena



6. GULAR PEDISTAL - height



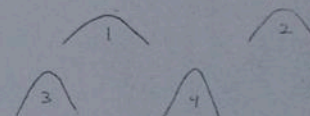
7. GULAR PEDISTAL - width



8. GULAR PEDISTAL - indentation



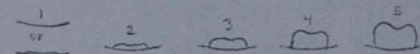
9. POST GENA - sharpness



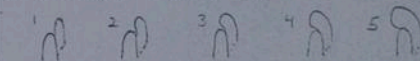
10. POST GENA - thickness



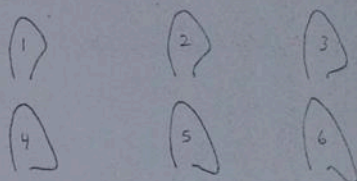
11. LIGULA EXPOSURE



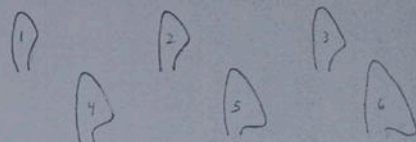
12. LIGULA OVERLAP



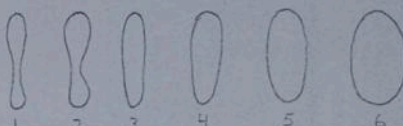
13. ♂ MAXILLARY PALPUS



14. ♀ MAXILLARY PALPUS



15. EYE SHAPE



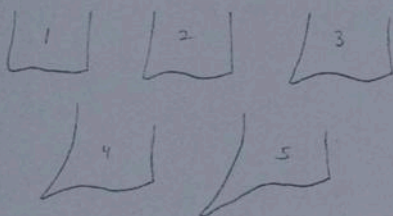
16. TARSAL SETAE



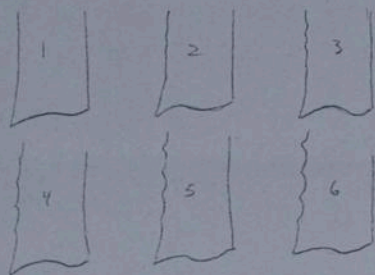
17. MESOTROCHANTIN - visibility



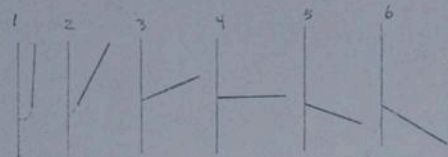
18. PROTIBIA - apical spine



19. PROTIBIA - lateral sculpture



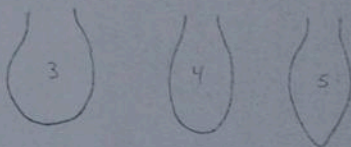
20. PROSTERNUM - angle of declivity



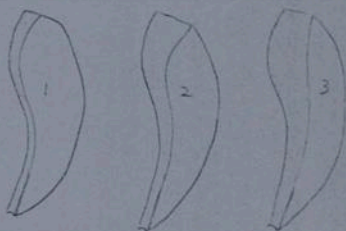
21. PROSTERNUM - ventral view

ill defined
not set off
1

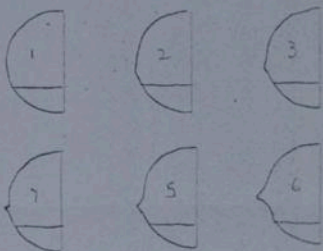
vaguely
defined
2



22. ELYTRA EPIPLEURA - thickness



23. ELYTRA EPIPLEURA - border



24. LENGTH

- 1 = less than 10 mm
- 2 = 10-13
- 3 = 13-16
- 4 = 16-19
- 5 = 19-22
- 6 = 22-25
- 7 = 25-28
- 8 = 28-31
- 9 = more than 31 mm

10 February 1969

Mr. Kirby W. Brown
Department of Entomology
School of Agricultural Sciences
University of California
Riverside, Calif. 92502

Dear Kirby:

Please forgive me for not having written sooner. I claim priorities for my time now to try to find money to keep ourselves alive.

We received your decks of cards and will only promise that within the next two weeks we will run them and send off the information as soon as we can. Sorry we can't promise faster action. I think you have done an outstanding piece of work in using the program to gather the most information for Gonasida. I sympathize with your distaste in doing subgraphs for 600 objects and suggest that going at it the way you have - that is making analyses of sufficiently small samples such that you understand what's going on is as good as is needed. If you have generated some programs for yourself which are satisfactory, then all the better. You have not, of course, run a program we have called CARANAL which was our effort to discover the information content of characters. We believe that program has a lot of use previous to the cluster analysis, much in the same way you have developed a coefficient of difference analysis. Some day it may be possible to tell you more about that, but not now.

You'll be hearing from us soon.

Sincerely,

David J. Rogers
Professor of Biology

DJR:gm

MEMO TO: Mr. Ralph Stilson, O.R.S.

FROM: David J. Rogers, Taximetrics Lab

SUBJECT: Check #2-51006, drawn on the Bank of America, against
the University of California's revolving fund.

This check is in payment for the shipment of cards and programs
Please credit to our account 1708-49, subsection 5-511.

Thank you.

12 November 1968

Mr. Kirby Brown
Department of Entomology
School of Agricultural Sciences
Riverside, Calif. 92592

Dear Mr. Brown:

We are pleased to see how well along you are with the study in terms of the particular applications of the output. Now that you have got this much under your belt, I would suggest the following sort of investigations might be useful. It is likely that now you can go back and play with your characters a little bit and discover what is happening to each of them in each of the clusters. For example were I you, I would look very carefully at your characters 15 and 16 to see what they are doing in each cluster. I personally have a very great deal of wariness about ratios, and wonder if you really have done what you intended to do in the states of characters 15 and 16, and whether you really would want them to play the game they are playing in this study. I suspect you will find some aberrances among those states when you plot them against the clusters formed.

With respect to the placement of your object #600 (lectotype of Gonacida elata) my guess is that in 1850 a fellow could have well been in West Texas and thought he was in Arizona. We have had other studies with such geographical anomalies and the machine program made us go back and look very hard for a more appropriate geography for the specimen.

At any rate we are pleased that your efforts are being rewarded. Maybe your next study, when you send it, will have those characters a little more tightly wired down as to how you want to play the game with them. We will be ready when you are ready.

Sincerely,

David J. Rogers
Professor of Biology

DJR:gm

UNIVERSITY OF CALIFORNIA, RIVERSIDE

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO



SANTA BARBARA • SANTA CRUZ

SCHOOL OF AGRICULTURAL SCIENCES
CITRUS RESEARCH CENTER AND
AGRICULTURAL EXPERIMENT STATION
DEPARTMENT OF ENTOMOLOGY

RIVERSIDE, CALIFORNIA 92502

January 31, 1969

Dr. David J. Rogers
Taximetrics Laboratory
Department of Biology
Armory 101
University of Colorado
Boulder, Colorado 80302

Dear, Dr. Rogers:

Time surely flies as I see that several months have passed since I last reported to you on the progress of the taximetric study of Gonosida. The main thing I have been doing is teaching myself the rudiments of FORTRAN so I could develop some programs to aid in the work. It has been interesting and frustrating (the computer insists on doing exactly what I said in the program rather than what I meant!). I'll just mention it briefly since the main reason I'm writing is to report on the other 2 studies you ran for me.

First I worked up a program to give the frequencies of each character state in the clusters, and means and standard deviations. This gives a good picture of the variability of the characters and which contribute to similarity and which don't. Then I worked up a statistical key which compares the characters of each specimen (punched on cards) with a matrix which gives the distance of each character state from the mean in stan. devs. for each species or group and prints out first and 2nd choice determination. I am very keen on developing this further as it seems quite a success on the 580 Gonosida specimens I ran thru it. Also I developed a program which could derive clusters similar to yours, only based on populations. It computes the mean and stan. dev. of character states for each population, compares the characters of all pairs of populations using the formula for "Coefficient of Difference" of Mayr et. al., 1953, p. 146 [$CD = (MEAN(B) - MEAN(A)) / (SD(A) + SD(B))$], then orders the population pairs in order of increasing average CD. Developing a clustering program is over my head yet, but with the 31 populations (some 350 specimens) I ran, it was fairly easy to do the clustering by hand. I think this method has some tremendous potentials when populations are available. It sort of automatically weights characters, since those which are less variable will contribute more to the average coefficient than will highly variable ones, in other words giving a clear statistical picture of the makeup of each population - and showing which features characterize that population (ie. make it recognizable as such) and which are peripheral and variable. The drawback I find with using "exemplars" of populations or species, is that one can't be very sure which characters are more or less constant, and which are variable within a population which could be a serious problem when large numbers of characters are used. I'm really not at all a biometrist so it's hard to explain, all I know is that the population method worked very well. I'll write later about this and explain more details and send sample printouts (which I'm a bit embarrassed to do since my programming will probably look awfully crude and primitive to you.).

Now back to the work which you ran. I worked out the subgraphs on the SMALL OVERLAP and WELL ORDERED (larger overlap) studies. It turned out to be a tremendously tedious job. (It was this in part which led me to develop computer keys, etc. as I absolutely

dreaded the thought of doing those subgraphs for almost 600 specimens.) The results were pretty good, and much better than the no-overlap study. Enclosed are maps and sample subgraphs of each study, a map showing my best estimate of what the final groups are, and a list of character frequencies based on the larger overlap study.

The first thing that is evident from all 3 studies, is that with few characters, the degree of overlap allowed between states makes a considerable difference in the clustering. The no-overlap was the most different and evidently the least accurate (while still giving a reasonable picture). Between the large and small overlap studies enclosed the following specimens clustered differently (so far as relation to "strong circles"), 55, 493, 410, 449, 601. Five out of 83 isn't bad. Of course the order in which pairs enter clusters varies between the studies but I haven't gone in to such detail, I was more interested in the gross picture and final groupings. I think one of the reasons I had problems working out the subgraphs is that so many objects remain outside of "strong circles". I believe this is because of the high variability of many of the characters. Note for example L-42 subgraphs of the SMALL OVERLAP study the conglomeration to the left of nos. 329 etc. in the big circle. That group forms its own strong circle only in the 3rd from the last clustering level, while in the WELL ORDERED (larger overlap) study this group formed a strong circle much earlier (relatively) and clusters (see L-55, 62) remained independent (no connecting pairs) longer. Therefore the SMALL OVERLAP study gave a fuzzier picture, which would seem to be the opposite of expectations. In order to see how the studies fitted what is close to my final picture compare the maps of the cluster studies with the Jan. 30 estimate. As of now it appears that there are but 3 subspecies (all runs done by your computer gave 3 main clusters of varying composition). Ela is so strongly differentiated from compar and difformis that it could qualify as a separate species, but in southern New Mexico things get pretty fuzzy between ela and difformis to the degree that I don't think there is genetic isolation. Genitalia and larvae show high uniformity thruout the range of the genus.

Some of the problems of localities have been solved. A review of literature shows that #600 was miss-labeled and is actually from the Big-Bend area of Texas where it should be. Nos. 418-419 are almost certainly miss-labeled and are probably from central New Mexico. No. 493 which gave trouble had a character state scored as 5 instead of 1 which could have been enough to throw it off.

Following your suggestion regarding ratios, I tabulated the frequency of character states of the 3 clusters. (Satellite objects were included with the main cluster with which they showed the strongest links.) This was done by hand before I got started with computer work (tabulation enclosed). However it clearly showed that some characters varied so much as to be useless. The measurements (chars. 11-16) were conspicuous in that regard. Characters 1, 2 and 7 also varied to such a degree and with means close enough as not to contribute to discrimination. Character 6 was difficult to score consistently so I threw it out, and character 8 was difficult to score because the states as set up were hard to interpret so I threw it out also. This left 8 characters (circled in red), some of which also would appear as candidates for rejection except that examination of many specimens indicated they may be of use. Also I found a character not used before which seemed promising, so I added it for the new studies.

So now we get to the new studies. First is that I am interested in comparing 16 characters with the 8 selected out of them using the SMALL OVERLAP parameters to

Jan. 31, 1969

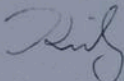
see how the picture compares with 16 characters. The second is with character 9 added and all cards rescored (as part of a check to see how much I change concepts of character states after the passage of time). I am sending the cards in a package and would again appreciate your help in running these. The cost can be charged to the same number as before. The set for the 8 character study has 9 characters punched, but parameters are given for the first 8 (in other words I want the machine to read only the first 8 positions). If there is any problem let me know. The other study of course is set up for 9 characters.

Needless to say I probably will not be running the almost 600 specimens since the computer key and population study seem to have covered them pretty well. However I may yet run a generic study of 100 to 150 objects. I'll let you know on this. Something of a rush has been pressed on me with the offer of an interesting job in Central America starting in April, so I shouldn't be getting into new things, yet to do the job I want in my dissertation there are several more things I want to look into still. Since I haven't started writing, I'll have to do some of it (the writing) in absence if I take the job. I'll admit I'm still entertaining the hope of finding a position in the states that will allow me to continue work in systematics (the Central American job is strictly pest control research).

This letter got very long, yet I have only scratched the surface of what has been going on the past few months. I apologize for overburdening you with this discourse. I am very grateful for your help and for the opportunity to discuss these things with you thru the mails.

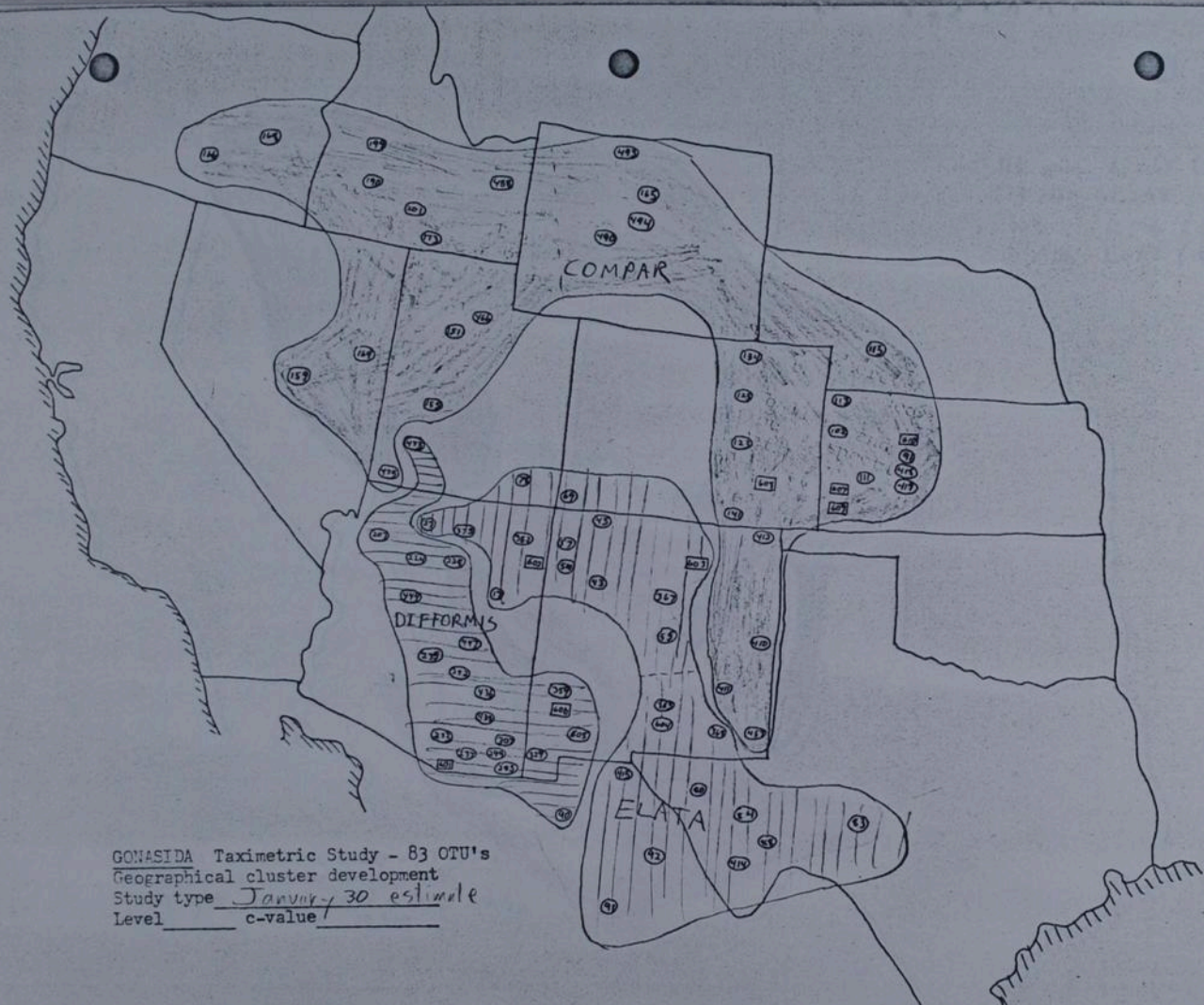
I look forward to hearing from you.

Yours very sincerely,



Kirby W. Brown

Enclosures



GONASIDA Taximetric Study - 83 OTU's
 Geographical cluster development
 Study type January 30 estimate
 Level c-value

111 joins $L = 63$ (.69034)
 173 + 43 $L = 64$ (.67979)
 603 $L = 66$ (.67695)
 57,418 $L = 67$ (.67159)

GONASIDA Taximetric Study - 83 OTU's
 Geographical cluster development
 Study type well ordered - large overlap
 Level 62 c-value .69229

[illegible]

$L = 49$

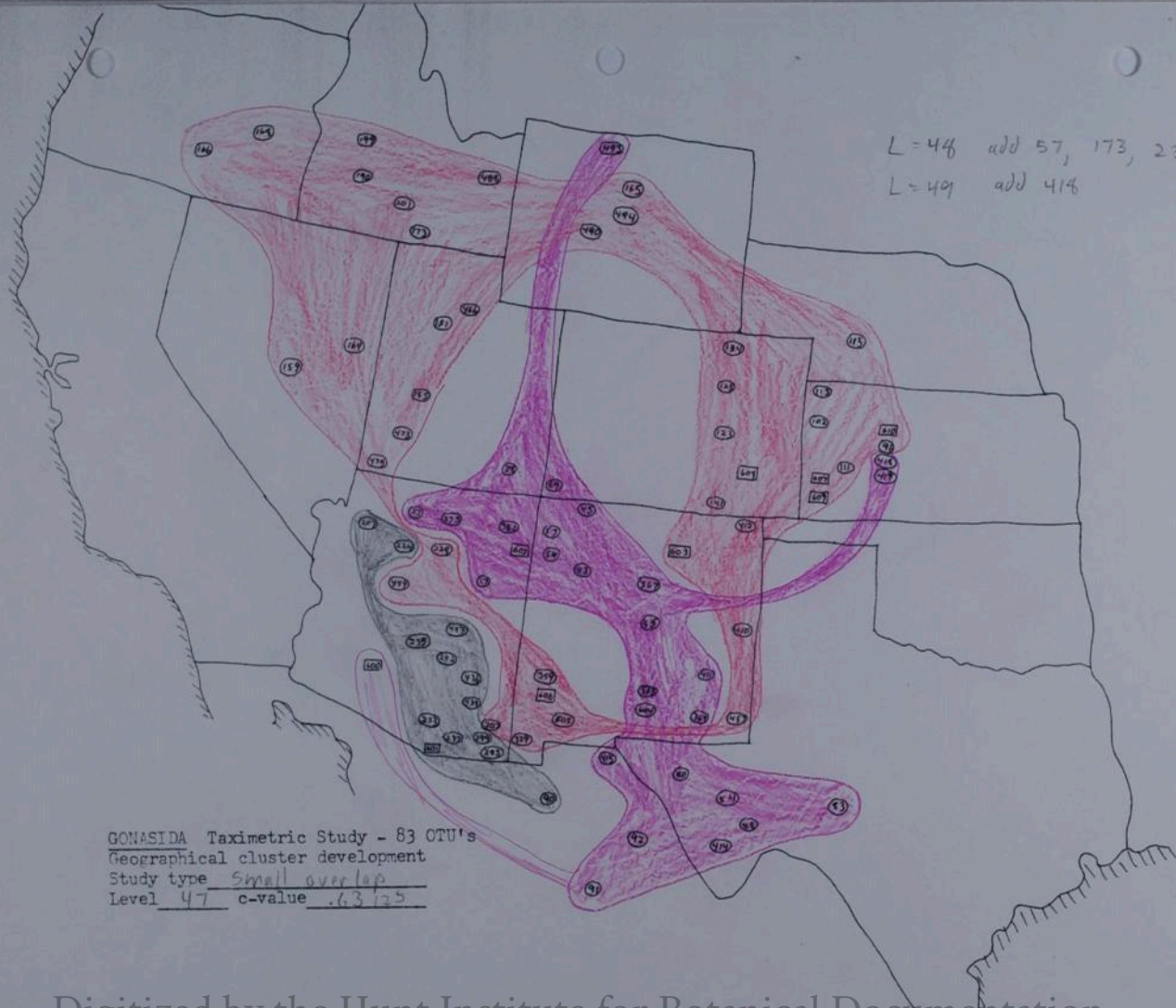
```
graph TD; 382((382)) --- 17[17]; 382 --- 419[419]; 17 --- 45[45]; 17 --- 27[27]; 45 --- 84[84]; 45 --- 414[414]; 27 --- 604[604]; 27 --- 54[54]; 419 --- 69[69];
```

86 - 415 - 411

[illegible]

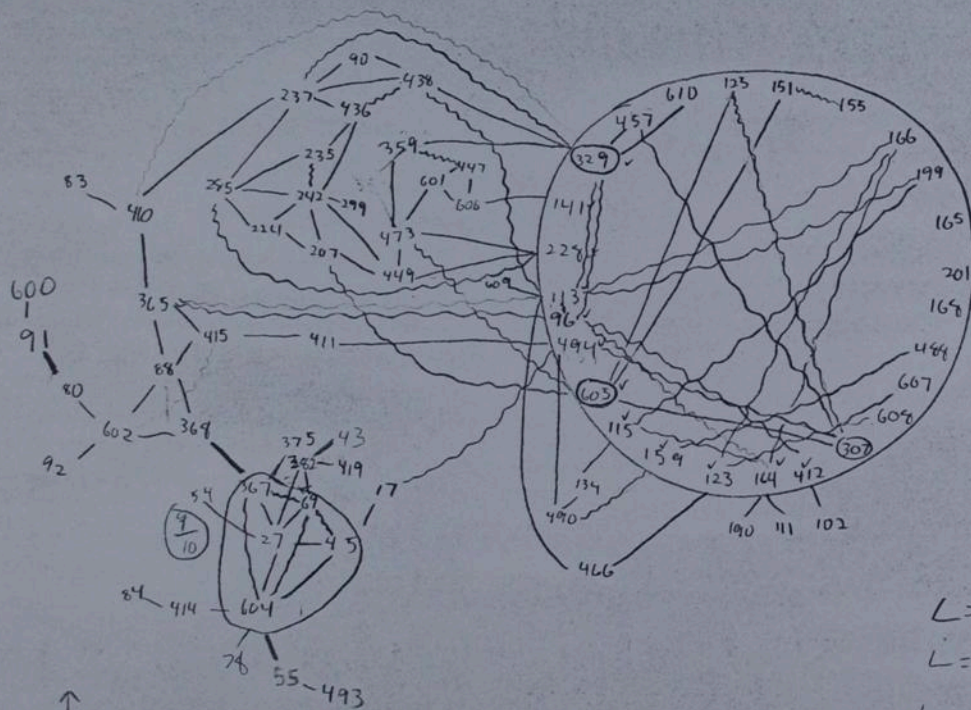
410-365

$$375 - 367 = 8$$



L=42

55-493 ↘



74 774 777 777

72
19
91

26
25
130
52
650/2 = 325

91/325

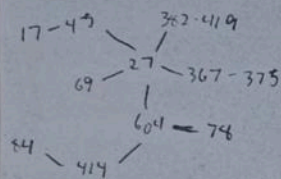
L=43 purple 93/325

L=44 red 93/325

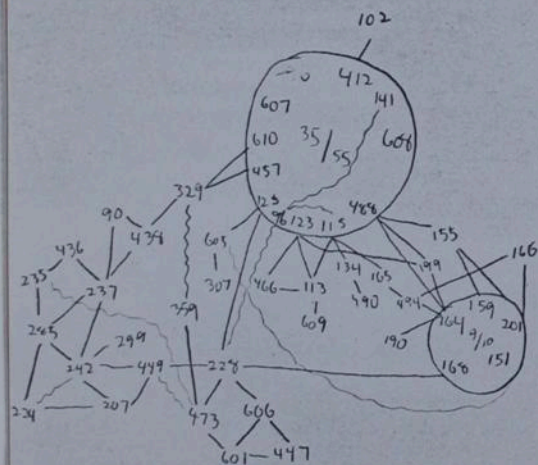
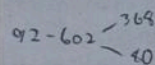
L=45 blue 100/325

↑
91-600

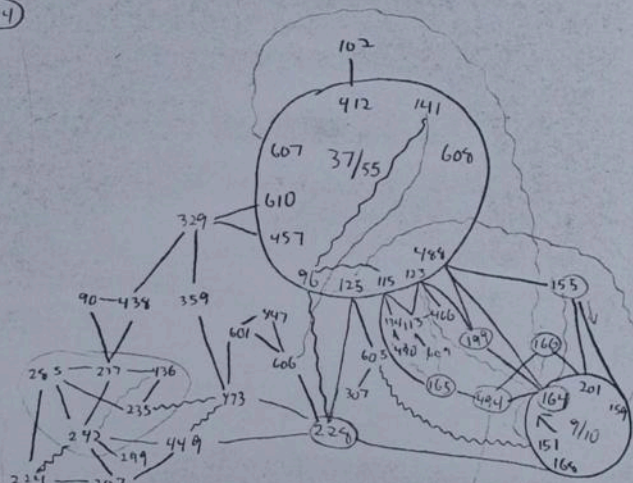
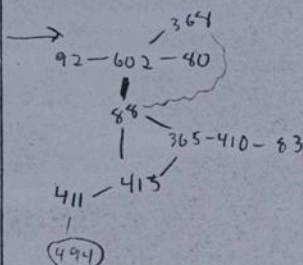
L=36



55-493



L=301



	red (41)	black (13)	violet (29)
1	8	4	6
2	11	4	12
3	10	3	7
4	11	2	4
5	1	0	0

1	0	0	0
2	0	0	0
3	15	3	8
4	22	7	14
5	4	3	7

1	2	0	1
2	4	0	1
3	14	0	5
4	17	5	17
5	0	4	5

1	0	3	1
2	1	9	4
3	24	1	14
4	13	0	7
5	3	0	3

1	2	0	2
2	14	1	6
3	12	3	9
4	8	7	9
5	1	2	3

1	2	0	0
2	10	1	5
3	16	0	10
4	13	2	7
5	0	10	7

too subjective

	red (41)	black (13)	violet (29)
1	0	0	2
2	7	3	7
3	11	4	4
4	13	5	8
5	10	1	8

1	4	0	12
2	3	0	9
3	0	0	3
4	27	5	5
5	7	8	0

1	16	2	5
2	14	10	8
3	6	1	6
4	1	0	7
5	0	0	3

1	0	0	15
2	0	0	4
3	6	0	10
4	20	2	0
5	15	6	0
6	0	5	0

1	0	0	27
2	9	0	2
3	21	3	0
4	7	1	0
5	3	6	0
6	1	3	0

1	0	0	2
2	6	5	9
3	9	6	4
4	23	1	4
5	3	0	9
6	0	1	1

1	0	0	2
2	6	5	9
3	9	6	4
4	23	1	4
5	3	0	9
6	0	1	1

	red (41)	black (13)	violet (29)
1	0	1	4
2	0	0	12
3	7	2	8
4	25	3	5
5	4	7	0

1	1	0	0
2	2	1	1
3	16	2	5
4	18	7	12
5	4	0	11
6	0	3	0
7	0	0	0

1	2	1	0
2	5	7	4
3	10	3	11
4	16	2	6
5	6	0	7
6	1	0	1
7	1	0	0

1	3	0	0
2	6	0	1
3	8	0	9
4	12	1	5
5	8	4	9
6	3	3	4
7	1	1	1

1	3	0	0
2	6	0	1
3	8	0	9
4	12	1	5
5	8	4	9
6	3	3	4
7	1	1	1

1	3	0	0
2	6	0	1
3	8	0	9
4	12	1	5
5	8	4	9
6	3	3	4
7	1	1	1

1	3	0	0
2	6	0	1
3	8	0	9
4	12	1	5
5	8	4	9
6	3	3	4
7	1	1	1

01, 3, 4, 5, 9, 10, 11, 12, 13, 14

NOV 6 1968

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SCHOOL OF AGRICULTURAL SCIENCES
CITRUS RESEARCH CENTER AND
AGRICULTURAL EXPERIMENT STATION
DEPARTMENT OF ENTOMOLOGY

RIVERSIDE, CALIFORNIA 92502

November 5, 1968

Dr. David J. Rogers
Taximetrics Laboratory
Department of Biology
Armory 101
University of Colorado
Boulder, Colorado 80302

Dear Dr. Rogers:

First off my thanks to you and Mr. Wong for all your help in running my data. I have worked up the "simple" study which you sent last week and the results are enclosed. Yesterday I received the "well ordered" printout. Please do not be concerned about the delays on the 3rd study as I have plenty to do with what you sent. Also this Friday I am leaving for a week's trip to Honduras so probably won't be able to do much until returning.

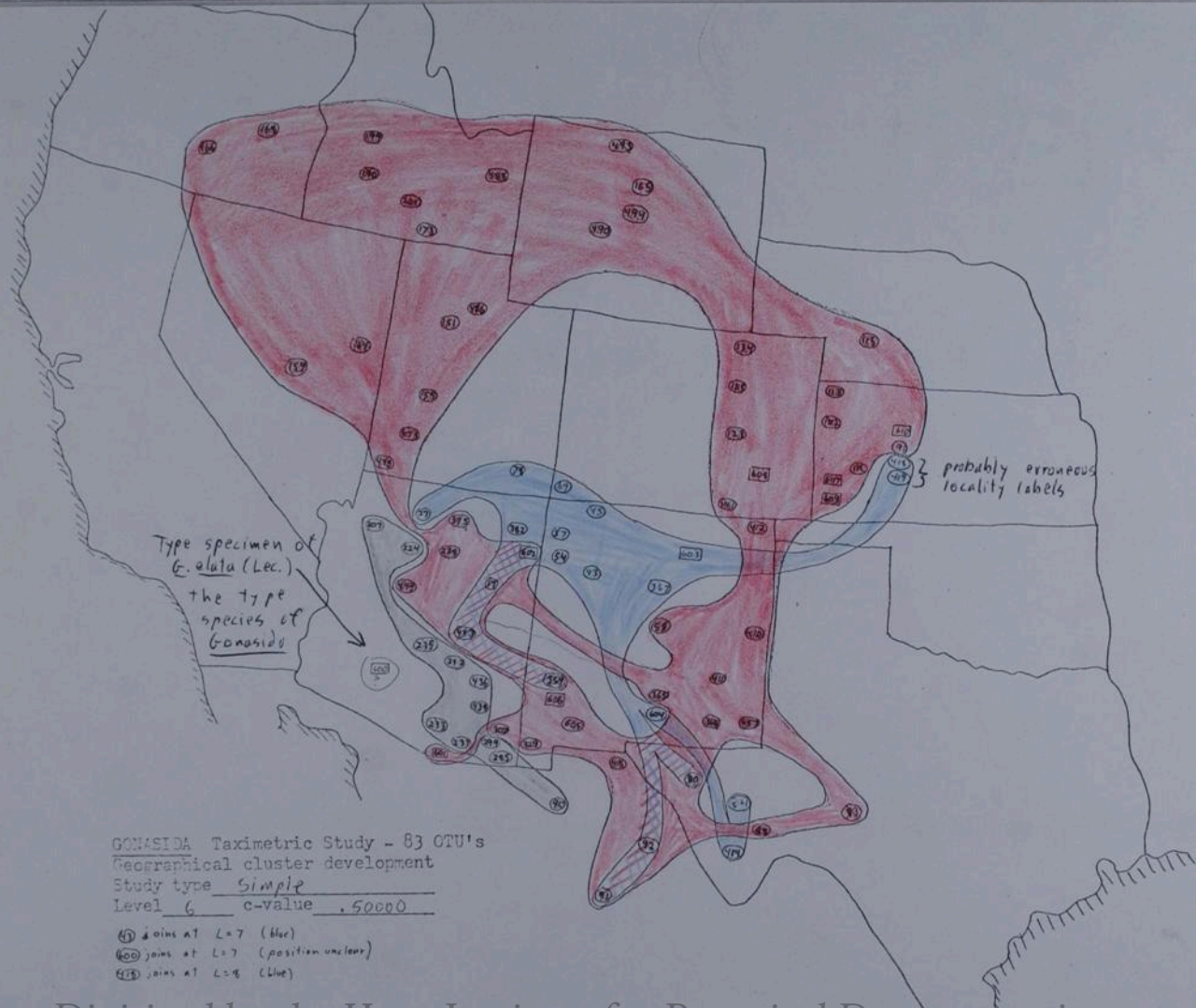
The results of the first study were extremely interesting. With no overlap of character states I expected the results to be close to useless. However they are surprisingly good, although there are some problems. The level 6 map sums up the study. Three main groupings show up which is what I expected. (However I am purposefully not referring to the specimens yet until I have worked up all the subgraphs, etc. of each study so as not to be too biased at this point). There are some problems though, particularly with the "blue" cluster where the relationships of nos. 602, 17, 447, 359, 80, 92 & 91 are rather ambiguous (indicated on map by blue & red hatching). Also I believe most of the SE New Mexico, and Texas forms should be in the "blue" cluster. On the other hand the "black" cluster should be less sharply set off from the "red" than is the "Blue". (Note at present I am refraining from using any species names at present). However as noted above, these problems are more minor than I expected, and even this study puts things in the right ballpark. Some of the problems that make the distribution look strange are possibly due to other causes. For example nos. 418, 419 (specimens labeled "Gove Co., Kans.") are probably wrongly labeled as they look like they should be from NE New Mexico. No. 600 is the biggest headache of all. This is the LECTOTYPE of *Gonasida elata* (Leconte) the type species of *Gonasida*. It doesn't cluster well with anything. (It doesn't fit well in the "well ordered" study either). Its locality is "Gila Valley, Ariz." (collected around 1850) but I thought it resembled the Texas forms. However in the studies it shows no clear links to that area, and as an aside there have never been any more *Gonasida* collected anywhere near Gila Valley. This will take some puzzling out.

I would say the main drawback of the simple study with no overlap and only 16 characters is that there are so few clustering levels. Therefore the clusters grew very rapidly (pattern virtually complete by L=6) making the job of drawing subgraphs pretty tough (thus I had to tabulate the results to organize it - zerox copy of the 4 pages enclosed). Also there seemed little sensitivity to possible subspecies. Another problem is that similar looking specimens may score very low on the simple study, but come out high when overlap is allowed. I will report results.

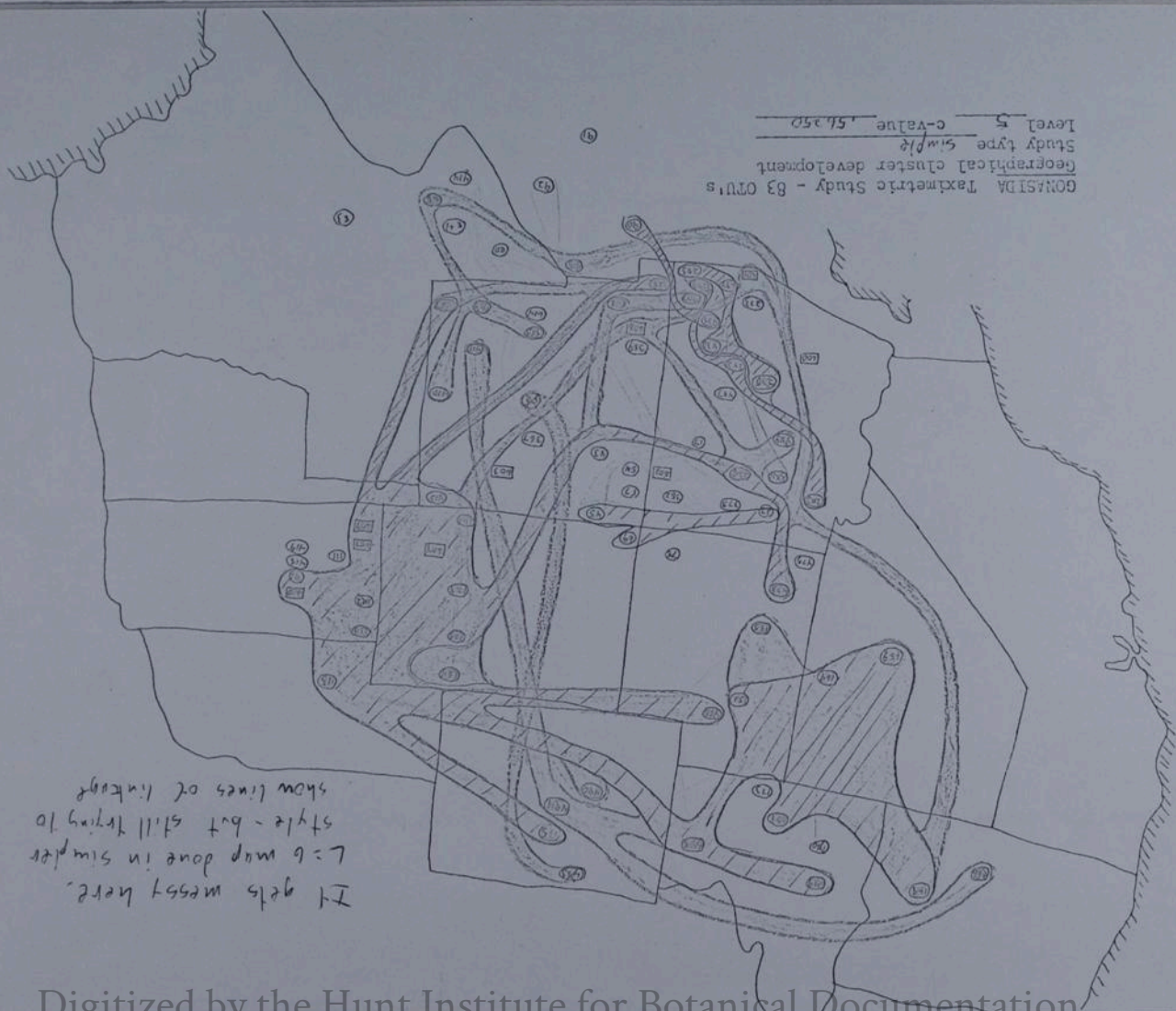
Sincerely, *David J. Rogers*

Kirby W. Brown

cc. J. Wong
Encl.



GONASIDA Taximetric Study - B3 OV's
 Geographical cluster development
 Study type simple
 Level 5
 c-value .51, .50



/// areas indicate clustering
at previous level

Kansas, Colo.
appears as
major center

GONASIDA Taximetric Study - 83 OTU's
Geographical cluster development
Study type Simple
Level 4 c-value .62500

Pairs joining at $L=7$

$$C(7) = .43750$$

43 - 91, 382

600 - 92, 91, 292, 367,
375, 438, 327, 603

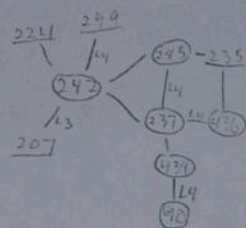
pairs joining at $L=8$

$$(4) = .37500$$

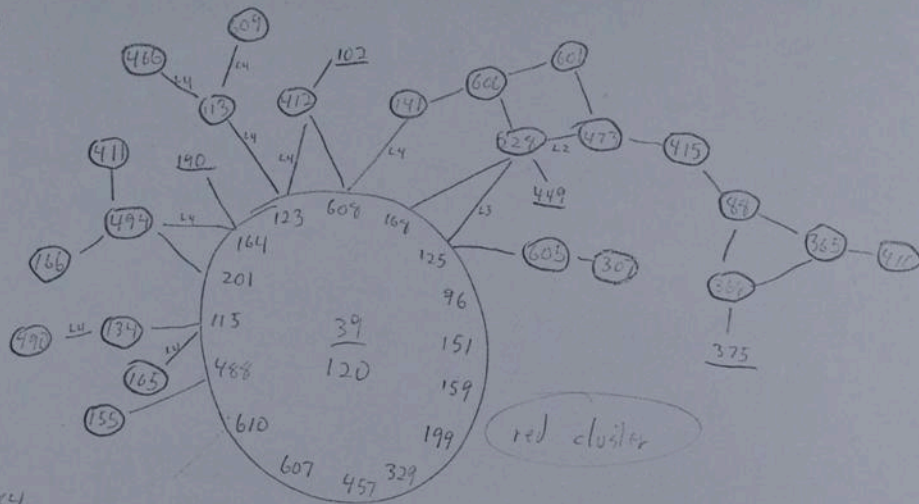
418 - 27, 43, 57, 342

$$L=5$$

$$C(5) = .56250$$

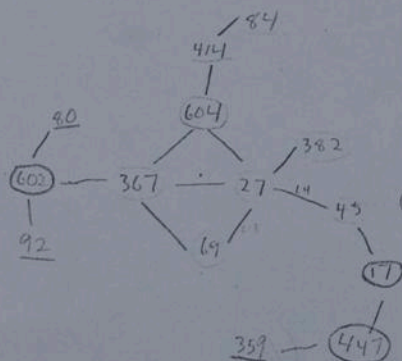


black cluster



red cluster

55-493



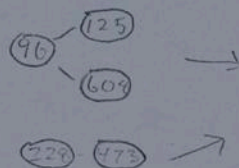
blue cluster

$L=1$

$C(1) = .81250$

$235 - (436) \rightarrow$

$235 - (436) \rightarrow$



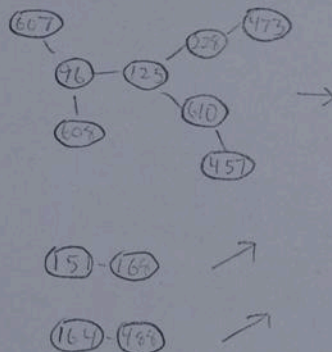
$L=2 \quad C(2) = .75000$

$L=3 \quad C(3) = .68750$

$L=4 \quad C(4) = .62500$

$235 - (436) \rightarrow$

$207 - (242) \rightarrow$

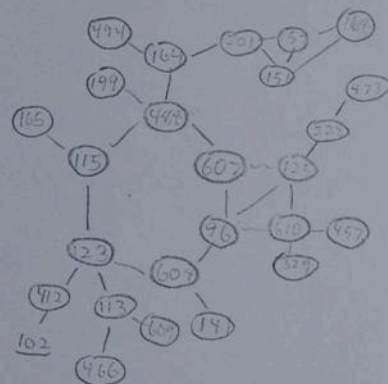


$27 - 69 \rightarrow$

$235 - (436) - (257) - (385) \rightarrow$

$299 - (243) - 207 \rightarrow$

$90 - (438) \rightarrow$



$45 - 27 - 69 \rightarrow$

red cluster

	L=6 C(6) = .50000	L=5 C= .56250	L=4 C=.62500	L=3 C=.68750	L=2 C=.75
✓ 17	13 23 35	45 47			
88	22 96 410	365 415 369			
96	38 53 228 365 369 166 487	123 164 329 489	✓ 410	607	125 609
113	17 76 199 229 15		228 416 60		
115	41 139 325 412 601 410 609	179 125	✓ 22 165 489		
123	7 161 125 329 166 457 499 366 607	96 159 610 489	✓ 113 115 412 609		
125	59 123 89 301 329 14 457 472 609	605 115 489	✓ 607	228 610 96	
134	15 411	116	490		
141	115 125	609	609		
✓ 151	475 166 164 499		✓ 159 201	169	
155	59 201 169	469			
✓ 159	12 55 125 490	169	✓ 151 166 20		
✓ 164	111 123 166 155 151 416 609 607	190 159 96 169 99	✓ 201 499	489	
✓ 165	141 139 166 113 499 499		115		
166	151 201 165 164 329 123 96	494			
169	472	201 228 164	✓ 159	151	
199	125 115 113 610 607	228 164	✓ 489		
✓ 201	475 166 155	169 499	✓ 169 159 151		
✓ 228	96 415	499 606 169		125	473
✓ 329	29 436 113 166 125 123 115 365 410 607	96 457	✓ 610		
365	17 96 329 415 609	88 369 410			
✓ 368	201 96	365 125 89			
✓ 410	93 237 609 88 329 415	365			
✓ 411	11 139 415	494			
✓ 412	55 115	609	123 102		
✓ 415	609 54 601 365 411 410 228	89 473			
✓ 451	49 96 123 125 307	329 607	✓	610	
✓ 466	436 164 190 123		113		
✓ 473	235 606 609 499 125 169 609	601 415			228
489		155 609 125 133 96 610	115 199 169	164	
490	165 159		134		
494	123 165 151	166 411 201	169		
✓ 602	415 410 365 88 69	40 367	92		
609	411 473	609 329 411			

red cluster

	L = 6 C(6) = .50000	L = 5 C = .56250	L = 4 C = .62500	L = 3 C = .6875	L = 2 C = .75
(607)	15 (19) 32 (16) 123	457 (610)	✓ 473 (125)	96	
(608)	164 (125) 115	486 (112) 610	✓ 141 (123)		96
✓ 609	55 (365) 473		113		
(610)	199 (115)	123 (608) 607 484	✓ 329 96	125 457	
54	367 (113) 419				
55	312 (69)	493			
80		600			
102	190		412		
111	184 (111)				
173	159				
190	102 (466)	164			
✓ 307	83 (125) 457	605			
359	329	447			
449	207 473	228			
475	(51) 20				
493		55			
(601)	447	473 604			
✓ 605	207 473	125 307			
✓ 414	109 601	17 359			
	154	72	42	12	6

3
6
21
39
77
146

blue cluster

L = 6 C(6) = .50000					L = 5 C = .56250		L = 4 C = .62500		L = 3 C = .6875		L = 2 C = .75	
27	57				382	367 604		45		13		
45	419 69 367 382 604				(17)			27				
69	603 45 382 604 (602)				367					27		
367	54 382 419 92 45				69 604 27 (602)							
382	419 69 45				27							
419	(45) 54 45 382 367											
604	78 (65) (415) 69 45				414 367 27							
57	27											
78	603 604				414							
84												
91	92											
92	91 367							(602)				
375	367				(367)							
414					84 604							
603	78 69											

L6 - blue circle 32 = 16 connect

black cluster

	L=6 C(6) = .50000	L=5 C= .56250	L=4 C=.62500	L=3 C=.6875	L=2 C=.75	L=1 C=.8125
90	237 299 242		436	436		
237	410 90 242	436 242	436 242			
~~237~~						
242	436 90	237 224 245	299	207		
245	233 90 436 224	242 235	237			
436	83 245 242 436		237			235
438	229 436 436	237	90			
83	410 235 207 436					
207	436 235 242			242		
224	207 245	242				
233	245					
235	83 436	245				436
299	90		242			

LG black circle 24 = 12 conn.

2 October 1968

Mr. Kirby W. Brown
Department of Entomology
School of Agricultural Sciences
University of California
Riverside, Calif. 92592

Dear Mr. Brown:

You seem to be well organized and have understood the way to establish information for running our program. The list of characters you presented is well established and has good validity for taxonomic work. Let me make one suggestion which you may think more time consuming than we can afford (who can afford time these days?). As I look at your input characters I see that you have ordered every character or prepared a matrix for some of them. While this is indeed a useful arrangement, when attempting to indicate relationships, it sometimes "fuzzes the edges" of taxa which may form up, and make a really sound interpretation difficult. Therefore, try a run where no characters are allowed any overlap on a few (maybe 50 objects or OTU's) which you know or have some good intuitive understanding of. The purpose in this is for you to clearly see separation, so that you get the organisms (taxa) pried apart cleanly. I think you can see that non-ordered, non-matrix types of characters give a cleaner separation than would the ordered and matrix types. When you have seen this output then I believe you will be in a much better position to establish the ordered information than you possibly can be right now.

Please send us first 50 (perhaps 75) objects described with all characters, none ordered, nor with matrix-type. After this run, you will most likely have a better chance to decide about ordering the characters for the full run.

After this exercise then you can go full blast on all of your objects with data organized in the best manner for accomplishing your task. We are ready for you now and any time you get your data punched we will take it, run it, and fire it back to you posthaste. I am hoping the Mr. Reagan has not knocked your budget so badly that you can't afford to use the fastest mail service for sending things.

Sincerely,

David J. Rogers
Professor of Biology

DJR:gm

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DEPARTMENT OF ENTOMOLOGY

RIVERSIDE, CALIFORNIA 92502

September 24, 1968

Dr. David J. Rogers
Taximetrics Laboratory
Department of Biology
University of Colorado
Boulder, Colorado 80302

Dear Dr. Rogers:

Thank you very much for your letter of 29 August and the reprints. I'm sorry for the delay in responding. Early September I went on a collecting trip to Arizona and upon returning found my self spending several days in the hospital which put my work badly behind.

I certainly appreciate your kind offer to spend a few days with me to explain the fine details of your programs. Unfortunately it does not seem possible at present. Because of Federal budget cuts, the research funds of my fellowship have been reduced, leaving enough (I hope) for the computer time and not much more. So I'll just have to "muddle along" and hope the results come out good.

Actually I had already set up the characters and states prior to writing you as I had been considering a rather simple objective study using a homemade punch system (sample card enclosed). I quickly learned that this system would be too unwieldy and time consuming, so I abandoned the idea and decided a computer method was needed. In order to make a rough test of the validity of my selection of characters I scored 20 specimens which were the most diverse morphologically and geographically. After making a matrix by comparing holes in the cards (score of 1 for corresponding states, score of 0.5 for adjacent states, 0 for all others), I plotted the OTU's on a map (copy enclosed), and linked them together according to similarity to see what patterns showed up. I was very encouraged to see that a reasonable pattern developed which checked quite well with the specimens. Furthermore it was a pattern which I would have had great difficulty visualizing without the numerical approach. Therefore I do believe my choice of characters will give a useful result.

In getting away from the 15 character limit of the punch card I went back to try to add more characters. I ended up removing one and adding 2 so it is much the same. I realize this is a small number of characters, but I think it will work, we shall see. Also I found my original division of most characters into 5 states stood as representing good increments of characters. The majority of are well ordered characters. Enclosed is my latest character list, indicating states, degree of overlap, matrices, etc. Also I am sending an earlier illustrated character list and some illustrations of *Gonosida* to give some idea of what they mean. I would very much appreciate any comments or suggestions regarding the set up.

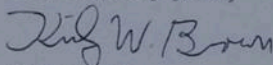
Right now I am starting measurements which should take a week or so. Then I will record character states, so if there are any serious flaws in my system there would be time for me to make changes. Please don't take a lot of time but at least a glance at the character list would be appreciated.

Of course after getting the results, I will check them with geographical variation, independent studies of genitalia and larvae, and with my own judgement. Therefore the computer results may be modified, but they will form a highly useful base of operations. It would also be interesting to try different degrees of overlap using the same data to see what happens to the clustering. However at first I'd better make 1 run and see how the results look and what the cost is.

I presume the best method is to have the cards punched here according to your instructions for input deck setup, and then send to you.

Thank you for your assistance.

Very sincerely yours,

A handwritten signature in cursive script, reading "Kirby W. Brown".

Kirby W. Brown

September 24, 1968

Kirby W. Brown
Dept. of Entomology
Univ. of California
Riverside, Cal. 92502

PROPOSED TAXIMETRIC STUDY OF THE GENUS GONASIDA (COLEOPTERA, TENEBRIONIDAE)

LIST OF CHARACTERS AND STATES

- | | | | | | |
|---------------------------------------|-------|-------|-----|-----|---|
| 1. PRONOTUM, APICAL ANGLE | | | | | |
| 1. lacking | NCS=0 | | | | |
| 2. obtuse | N=5 | | | | |
| 3. right | K=2 | | | | |
| 4. acute | | | | | |
| 5. acuminate | | | | | |
| 2. PRONOTUM, ANTERIOR LATERAL MARGIN | | | | | |
| 1. weakly concave | NCS=0 | | | | |
| 2. linear | N=5 | | | | |
| 3. weakly convex | K=2 | | | | |
| 4. moderately convex | | | | | |
| 5. strongly convex | | | | | |
| 3. PRONOTUM, POSTERIOR LATERAL MARGIN | | | | | |
| 1. weakly convex | NCS=0 | | | | |
| 2. linear | N=5 | | | | |
| 3. weakly concave | K=2 | | | | |
| 4. moderately concave | | | | | |
| 5. strongly concave | | | | | |
| 4. PRONOTUM, APEX OF ALAE | | | | | |
| 1. sharp | NCS=0 | | | | |
| 2. moderately sharp | N=5 | | | | |
| 3. blunt | K=2 | | | | |
| 4. very blunt | | | | | |
| 5. rounded | | | | | |
| 5. PRONOTUM, REFLEXION OF ALAE | | | | | |
| 1. flat | NCS=0 | | | | |
| 2. slightly reflexed | N=5 | | | | |
| 3. moderately reflexed | K=2 | | | | |
| 4. strongly reflexed | | | | | |
| 5. very strongly reflexed | | | | | |
| 6. PRONOTUM, WIDTH OF MARGIN | | | | | |
| 1. very narrow | NCS=0 | | | | |
| 2. narrow | N=5 | | | | |
| 3. moderate | K=2 | | | | |
| 4. wide | | | | | |
| 5. very wide | | | | | |
| 7. SCUTELLUM, SHAPE | | | | | |
| 1. broad | NCS=0 | | | | |
| 2. equilateral | N=5 | | | | |
| 3. slightly elongate | K=2 | | | | |
| 4. elongate | | | | | |
| 5. very elongate | | | | | |
| 8. ELYTRA, CONVEXITY OF SUTURAL COSTA | | | | | |
| 1. level & flat | NCS=5 | 1 | 2 | 3 | 4 |
| 2. elevated & convex | N=0 | 2 0.2 | | | |
| 3. elevated & flat | K=0 | 3 0.2 | 0.5 | | |
| 4. strongly convex & split | | 4 0 | 0.2 | 0.3 | |

9. ELYTRA, SCULPTURE OF SUTURAL COSTA

- | | |
|-------------------------------|-------|
| 1. very smooth and regular | NCS=0 |
| 2. smooth, slightly irregular | N=5 |
| 3. slightly creased | K=2 |
| 4. rugose and irregular | |
| 5. very rugose and irregular | |

10. ELYTRA, LATERAL COSTAE

- | | |
|-------------------------|-------|
| 1. flat, barely visible | NCS=0 |
| 2. flat, visible | N=6 |
| 3. weakly convex | K=2 |
| 4. moderately convex | |
| 5. strongly convex | |
| 6. very strongly convex | |

11. ELYTRA, CONVEXITY OF INTERVALS

- | | | | | | | |
|----------------------------------|-------|---|-----|-----|-----|-----|
| | | 1 | 2 | 3 | 4 | 5 |
| 1. flat | NCS=6 | 2 | 0.5 | | | |
| 2. slightly convex | N=0 | 3 | 0.2 | 0.5 | | |
| 3. moderately convex | K=0 | 4 | 0 | 0.2 | 0.5 | |
| 4. strongly convex - broad | | 5 | 0 | 0.1 | 0.4 | 0.6 |
| 5. strongly convex - narrow | | 6 | 0 | 0 | 0.2 | 0.4 |
| 6. very strongly convex - narrow | | | | | 0.6 | |

12. ELYTRA, SCULPTURE OF INTERVALS

- | | |
|--------------------------------|-------|
| 1. smooth | NCS=0 |
| 2. very faintly rugose | N=6 |
| 3. evidently but weakly rugose | K=3 |
| 4. moderately rugose | |
| 5. strongly rugose | |
| 6. very strongly rugose | |

13. ELYTRA, DISCAL COSTAE

- | | |
|----------------|-------|
| 1. absent | NCS=0 |
| 2. weak | N=5 |
| 3. moderate | K=2 |
| 4. strong | |
| 5. very strong | |

14. TOTAL LENGTH (to nearest mm.)

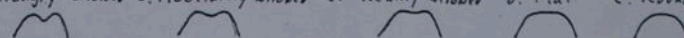
- | | | |
|---------------|---------------|-------|
| 1. 22 or less | 5. 29-30 | NCS=0 |
| 2. 23-24 | 6. 31-32 | N=7 |
| 3. 25-26 | 7. 33 or more | K=3 |
| 4. 27-28 | | |

15. RATIO, ELYTRA WIDTH/THORAX WIDTH

- | | | |
|---------------|---------------|-------|
| 1. under 1.09 | 5. 1.40-1.49 | NCS=0 |
| 2. 1.10-1.19 | 6. 1.50-1.59 | N=7 |
| 3. 1.20-1.29 | 7. above 1.60 | K=3 |
| 4. 1.30-1.39 | | |

16. RATIO, TOTAL LENGTH/ELYTRA WIDTH

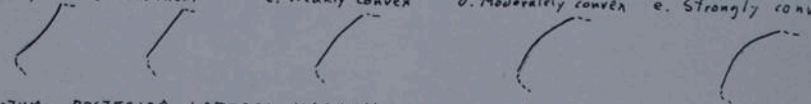
- | | | |
|---------------|---------------|-------|
| 1. under 2.09 | 5. 2.40-2.49 | NCS=0 |
| 2. 2.10-2.19 | 6. 2.50-2.59 | N=7 |
| 3. 2.20-2.29 | 7. above 2.60 | K=3 |
| 4. 2.30-2.39 | | |

- X CLYPEUS a. Strongly bilobed b. Moderately bilobed c. Weakly bilobed d. Flat e. Round
- 

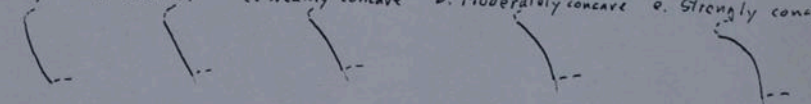
① 2. PRONOTUM - APICAL ANGLE

- a. Lacking b. obtuse c. Right d. Acute e. Acuminate
- 

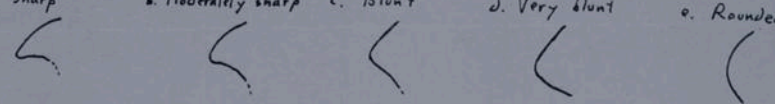
② 3. PRONOTUM - ANTERIOR LATERAL MARGIN

- a. Weakly concave b. Linear c. Weakly convex d. Moderately convex e. Strongly convex
- 

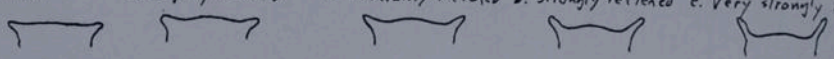
③ 4. PRONOTUM - POSTERIOR LATERAL MARGIN

- a. Weakly convex b. Linear c. Weakly concave d. Moderately concave e. Strongly concave
- 

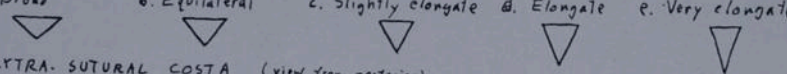
④ 5. PRONOTUM - APEX OF ALAE

- a. Sharp b. Moderately sharp c. Blunt d. Very blunt e. Rounded
- 

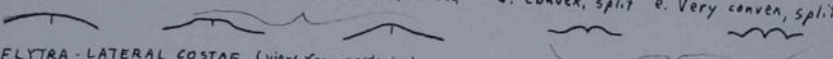
⑤ 6. PRONOTUM - REFLEXION OF ALAE (view head on)

- a. Flat b. Slightly reflexed c. Moderately reflexed d. Strongly reflexed e. Very strongly reflexed
- 

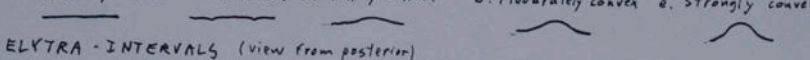
⑦ ~~7.~~ 7. SCUTELLUM

- a. Broad b. Equilateral c. Slightly elongate d. Elongate e. Very elongate
- 

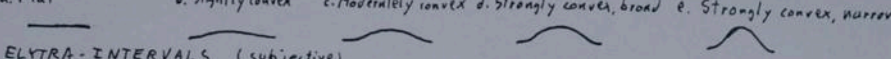
⑧ 8. ELYTRA - SUTURAL COSTA (view from posterior)

- a. Level + flat b. elevated + flat c. Elevated, convex d. Convex, split e. Very convex, split
- 

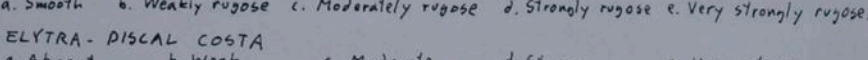
⑩ 9. ELYTRA - LATERAL COSTAE (view from posterior)

- a. Flat, barely visible b. Flat, visible c. Weakly convex d. Moderately convex e. Strongly convex
- 

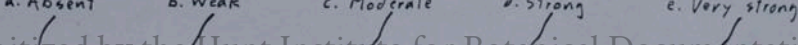
⑪ 10. ELYTRA - INTERVALS (view from posterior)

- a. Flat b. Slightly convex c. Moderately convex d. Strongly convex, broad e. Strongly convex, narrow
- 

⑫ 11. ELYTRA - INTERVALS (subjective)

- a. Smooth b. Weakly rugose c. Moderately rugose d. Strongly rugose e. Very strongly rugose.
- 

⑬ 12. ELYTRA - DISCAL COSTA

- a. Absent b. Weak c. Moderate d. Strong e. Very strong
- 

Similarity - out of 15 characters

11 or more ———

9-10.5 - - - - -

7-8.5 (dotted)

GONASIDA Csy.
based on 20 specimens
of wide geographic
range + morphological
variation

Tentative Division:

1. *elata* Lec. 80, 3
2. *acrop-Mex* 91
3. *inferna* Csy. 17, 7
2, 34
4. *compar* Csy. 96,
5. n. sp. - NW - 151,
6. *difformis* Lec. 207,
307,
359?

Possibly could div
into only two 2
with the rest
subspecies.

elata Lec

17, 54, 4
267, 364
40, 83,

difformis Lec
rest

COLEOPTERA (Tenebrionidae, tribe Asidini) desired by Kirby W. Brown
 Dept. of Entomology, University of California, Riverside, California 92502
 Expected duration of loan - 1 year from January 1968.

The photos should give an idea of the variation of the groups under study to help sort out undetermined specimens. Although only a sampling of the species could be illustrated here, all specimens in the genera listed are needed for the study. Also I would like to examine any Asidini you may have from MEXICO.



1.4 x
Glyptasida
aegra (Lec.)
 Texas



1.4 x
Glyptasida
costipennis (Lec.)
 Kansas to Ariz.



1.4 x
Glyptasida
sordida (Lec.)
 Kansas to Ariz.



1.4 x
Herthasida
ingens (Champ.)
 Mexico



1.4 x
Pelecyporus
mexicanus Sol.
 Mexico



1.4 x
Pelecyporus
aegrotus Lec.
 Baja Calif.



1.4 x
Pelecyporus
morbillosus Lec.
 Ariz. N.M. Sonora



Baja Calif.



Cal. & Baja Cal.



Arizona



Arizona, Utah



Calif.



Ore., Wash., Ida.



Nevada



1.4 x
Tisamenes
truquii Champ.
 Mexico



1.1 x
Gonasida
elata (Lec.)
 Texas & Mexico



1.1 x
Gonasida
difformis (Lec.)
 Kansas to Ariz.



1.1 x
Gonasida
 sp.
 Idaho, Wash.



1.7 x
 New Genus?
 Texas & Mexico

29 August 1968

Mr. Kirby W. Brown
Department of Entomology
School of Agricultural Sciences
University of California
Riverside, Calif. 92502

Dear Mr. Brown:

In answer to yours of August 23rd, we will be pleased to run your data on your insects here at Boulder. I am including herewith two papers which are significant and need to have your attention before any further operations. The first by Estabrook and myself gives you something about the necessary operations to establish your information in the best possible way to get good results with our graph-clustering method. The second is actually how to set up the decks for the computer.

I strongly recommend that you consider the possibility of spending a day or two here with us. The reason I suggest this so strongly is that in the past we have discovered that when other users wish to get the most benefit from our programs there are many nuances which are not apparent in any of our papers with which you should be familiar before you begin the arduous task of data preparation and punching. We will be glad to give you time here if you can find some way to come to Boulder for a day or two. This will save you time, money and much sweat to come here ~~before here~~ before you begin the process, so the sooner you can make it the better.

We no longer use the portapunch cards as the input to the system. It turned out that the portapunch cards were not of the same thickness as the readers of the regular size cards and we had to write special programs to get the portapunch cards into a format for processing. Let me know as soon as you can if it's possible for you to spend a day or two with us.

Sincerely yours,

David J. Rogers
Professor of Biology

DJR:gm

UNIVERSITY OF CALIFORNIA, RIVERSIDE

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO



SANTA BARBARA • SANTA CRUZ

SCHOOL OF AGRICULTURAL SCIENCES
CITRUS RESEARCH CENTER AND
AGRICULTURAL EXPERIMENT STATION
DEPARTMENT OF ENTOMOLOGY

RIVERSIDE, CALIFORNIA 92502

August 23, 1968

Dr. David J. Rogers
Department of Botany and Plant Pathology
Colorado State University
Fort Collins, Colorado 80521

Dear Dr. Rogers:

I am a graduate student in systematic entomology under Dr. E. I. Schlinger here at U. C.R. Enclosed are some sheets which give an idea of what I am doing. I have run into considerable problems with variation both within and between populations of these beetles which are not easily interpreted by traditional means. After reading articles on numerical taxonomy, particularly yours and Dr. Estabrooks, and after conversations with Mr. Peter Rauch, a fellow student and enthusiast for taxometric methods, I decided that your program for similarity measure and clustering may be very helpful to me. I hope to take a course in computer methodology this fall, but meanwhile wish to make sure I set up and record data correctly.

The problem that has arisen is that recently our campus has changed to a new computer (IBM 360 I believe). According to Mr. Rauch your program needs to be rewritten for the new machine. He hopes to do this but it may take him quite awhile. Meanwhile I hope to have my first group of data ready to process within a month. Therefore I would like to inquire if it would be possible for me to send the data for processing at your institution? If this were possible, then I would like to know in what form it should be sent. I have your article in 1963 AIBS bulletin and have obtained a Port-a-punch and scored cards. Enclosed is sample card set up as in the article. Do you still use this system and could I send the data in this form, or would it be better to have the cards punched at our computer center (in what format)? Of course I can pay all the charges for the use of your computer facilities.

At present I am planning two studies. The first involves the genus *Gonosida* (bottom of illustrated list). I have selected 14 characters with a total of 70 states. I will score from 500 to 600 specimens (each to be treated as an OTU). Therefore I make no judgement as to possible species or subspecies until I see how they are clustered by the computer and I plot distribution of the clusters on maps. I hope to have recorded all this data before the end of September. The second study would involve selected examples of most of the species in the tribe Asidini (now in 27 genera) in hopes of getting a picture of how valid the generic setup is and how correctly the species have been placed. I believe the present setup is very bad. This study would involve about 100 to 150 OTU's with ca. 25-35 characters with a total of up to 175 states. It would probably take until November or so to have this ready.

I am sorry to burden you with so many questions and hope I am not being too much of a bother. I very much appreciate any help you may be able to give

COLEOPTERA (Tenebrionidae, tribe Asidini) desired by Kirby W. Brown
 Dept. of Entomology, University of California, Riverside, California 92502
 Expected duration of loan - 1 year from January 1968.

The photos should give an idea of the variation of the groups under study to help sort out undetermined specimens. Although only a sampling of the species could be illustrated here, all specimens in the genera listed are needed for the study. Also I would like to examine any Asidini you may have from MEXICO.



Glyptasida
aegra (Lec.)
 Texas



Glyptasida
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 Kansas to Ariz.



Glyptasida
sordida (Lec.)
 Kansas to Ariz.



Herthasida
ingens (Champ.)
 Mexico



Pelecyphorus
mexicanus Sol.
 Mexico



Pelecyphorus
aegrotus Lec.
 Baja Calif.



Pelecyphorus
morbillosus Lec.
 Ariz., N.M., Sonora



Pelecyphorus
actuosus (Horn.)
 Calif., Nevada,
 Arizona, Utah



Pelecyphorus
 sp.
 Baja Calif.



Pelecyphorus
carinatus Lec.
 Cal. & Baja Cal.



Pelecyphorus
 sp.
 Arizona



Pelecyphorus
jaegeri Papp
 Calif.



Pelecyphorus
densicollis (Horn.)
 Ore., Wash., Ida.



Pelecyphorus
semilaevis (Horn.)
 Nevada



Tisamenes
truquii Champ.
 Mexico



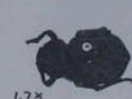
Gonasida
elata (Lec.)
 Texas & Mexico



Gonasida
difformis (Lec.)
 Kansas to Ariz.



Gonasida
 sp.
 Idaho, Wash.



New Genus?
 Texas & Mexico

February 5, 1968

From: Kirby W. Brown, Dept. of Entomology, Univ. of Calif., Riverside, Calif. 92502

REPORT ON PROGRESS OF STUDIES IN THE TRIBE ASIDINI (COLEOPTERA, TENEBRIONIDAE)

Since over two years have past since I initiated graduate studies I felt the time had arrived to report on my progress to institutions from which I have borrowed specimens and to those to which I am now writing regarding loans. I am majoring in systematic entomology under Dr. E. I. Schlinger. Studies began in June 1965 and I hope to be finished by December 1968.

The great emphasis of my work for the past 2 years has been field collecting and lab studies of the living insects. However in the Fall of 1965 I borrowed a considerable number of specimens which have been extremely valuable in determining what groups to concentrate on and where to collect. At present I have on hand about 12,000 specimens of the tribe Asidini which break down as follows:

500 originally in U.C.R. collection by 1965
500 added by U.C.R. staff and students 1965 to 1967
9000 borrowed from 30 institutions
2000 collected by myself 1965 to 1967

Traveling from June 1965 to the present has covered over 12,000 miles in 84 days in southern California, Arizona, S.W. New Mexico, and Mexico from Mexico City to Tehuantepec, with the object of collecting live specimens of Asidini. Additional live beetles were brought in from Kansas, Colorado and Utah by F. G. Andrews and from Nevada by E. F. Dailey. In all over 50 species in 13 genera were collected.

With the initial success of collecting in the Summer of 1965 my studies rapidly came to emphasize rearing of immatures obtained from eggs of living beetles. Major problems were encountered in developing rearing techniques and breaking diapause which took over a year to solve. The following is a summary of the genera from which larvae have been reared: Pelecyporus (9 species), Gonasida (2 sp.), Glyptasida (2 sp.), Parasida (1 sp.), Stenomorphus (8 sp.), Asidina (1 sp.), Stethasida (1 sp.), and Trichiasida (1 sp.). The species count is tentative. This study is proving very valuable in working out the classification of the tribe which is presently in a bad state. Other aspects under study include behavior, longevity, oviposition, phenology, and parasites.

In November and December of 1967 I visited institutions in New York, Washington, Philadelphia and Cambridge. Types of 235 species and subspecies in 22 genera were studied with particular emphasis on 62 species in the genera Pelecyporus, Gonasida, Glyptasida and relatives which will be revised in my thesis. Almost 1000 photographs were taken with a portable device especially made for the trip.

Future work will now concentrate on morphological studies of adults and larvae and the coding of this and other information onto punch cards. Considerable variation exists even within a single population and statistical analysis of measurements and characters may be needed to determine what are the limits of a species. Thomas Casey described the majority of species in the tribe. The limited amount of material he had led him to describe far too many individual variants as species, a situation which must be resolved. Although my thesis will probably be limited to the generic group mentioned above, I hope to be able to continue studies of immatures and adults in the other genera of Asidini.

(Aug. 23, 1968) Thesis probably will contain 1) full systematic revision of genus Gonasida incl. biology, ecology, descr. of early stages, etc. and 2) taxometric study of the genera of Asidini, with keys to genera, species, containing new synonymies and descriptions of new species.

6 November 1968
 INTERDEPARTMENTAL ORDER AND INVOICE UNIVERSITY OF COLORADO

Entomology, NDEA, K. Brown
 5-400330-23405-3

- ☐ PURCHASING OPERATIONS ☐ FOOD ☐ LAUNDRY ☒ OTHER (EXPLAIN)
- ☐ LINEN ☐ BOOK STORE ☐ PHYSICAL PLANT ☐ ALCOHOL
- ☐ PHARMACY ☐ PRINTING SERVICES ☐ MOTOR POOL

Univ. of California, Riverside

IN 31189

DEPARTMENT		BUD. CODE		OBJECT CLASS		
NUMBER	SUB.					
1708	48	5	548			
QUANTITY	DESCRIPTION			UNITS ISSUED	UNIT PRICE	AMOUNT
	Computer Charges, Oct. 25 - Nov. 5 (3 runs)					33.70
	Mailing					1.92
BILL TO KIRBY BROWN						
DELIVER TO						
ADDRESS				TOTAL		\$35 62

Taximetrics Laboratory - Biology Dept.
 Armory 101
 University of Colorado
 Boulder, Colo. 80302

REQUESTED BY EXTENSION DATE CHARGE ACCOUNT

6 November 1968

Mr. U. L. Riggs
Accounting Officer
Department of Entomology
School of agricultural Sciences
University of California
Riverside, Calif. 92502

Dear Mr. Riggs:

Kirby W. Brown has indicated that you are the person to handle the financial aspects of the computer analysis we have done for him here at the University of Colorado Computing Center. Enclosed is an invoice covering our expenses in his behalf.

Could you make payment to the Taximetrics Laboratory,
Account #1708-48? Thank you.

Sincerely,

David J. Rogers
Professor of Biology
Project Director

DJR:gm

J. Wong

+ 2.5 ml. @
7¢ mile = 17¢
T

1.0 7
1.0 7 T



to Kirby Brown

Kirby Brown Billing information

$$KBI = \$7.50$$

$$KB3 = \begin{array}{r} CP = \$15.60 \\ PD = 8.30 \\ \hline \$23.90 \end{array}$$

$$KB5 = \$2.30$$

$$\begin{array}{r} \text{Total : } 7.50 \\ 2.30 \\ \hline 23.90 \\ \$33.70 \end{array}$$

$$\begin{array}{r} + \text{Postage} \quad \$1.07 \quad \text{Oct 25} \\ \quad .85 \quad \text{Nov 6} \\ \hline 1.92 \\ 33.70 \\ \hline 35.62 \end{array}$$

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SCHOOL OF AGRICULTURAL SCIENCES
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AGRICULTURAL EXPERIMENT STATION
DEPARTMENT OF ENTOMOLOGY

RIVERSIDE, CALIFORNIA 92502

October 17, 1968

Prof. David J. Rogers
Taximetries Laboratory
Department of Biology
Armory 101
University of Colorado
Boulder, Colorado 80302

Dear Prof. Rogers:

I finally got off the ground and finished the first set of data. I fudged a little and went up to 83 objects which I hope is OK. Enclosed here are the FORTRAN statements in case any thing needs checking. In a separate package I am airmailing the punched cards. I hope I did it ~~fff~~ right as I am a strict novice.

For the computer charges the following is my account information for billing:

Entomology, N.D.E.A., K. Brown, 5-400330-23405-3

Bill may be sent to Mr. U. L. Riggs, Accounting Officer, Dept. of Entomology, U.C.R.

I appreciate your suggestion about a smaller scale run, and feel it will be a very wise move. I have gone a bit beyond your suggestion, and will leave it to you as to whether to run all that I sent. If it's not too expensive I would like to run all 3 sets of cards. These sets are:

✓
\$640.00
OK "SIMPLE CHAR." study - no overlap according to your suggestion
"WELL ORDERED" set up exactly like the character sheet I sent you
"SMALL OVERLAP" with a K value of 1 on most, a compromise between above 2.

I think it would be very worthwhile to run the 3 to get a good comparative picture of which gives the best clustering pattern. As you mentioned, the WELL ORDERED may not give good enough separation. On the other hand after scoring the specimens, it looks like the SIMPLE CHAR may separate too much. For this reason I set up the SMALL OVERLAP study.

The 3 card decks have the same data cards of course, and differ only in title, parameter and matrix cards.

I certainly appreciate your help and look forward to seeing the first results.

Sincerely,

Robert W. Brown
Robert W. Brown

25 October 1968

Mr. Kirby W. Brown
Department of Agronomy
School of Agricultural Sciences
University of California
Riverside, Calif. 92592

Dear Mr. Brown:

Enclosed is a copy of "How to Read the Printout," as well as the actual printout for your first study. It is most regrettable that neither your other two studies nor the Calcomp plot for the first have come out yet. This, however, is due to machine operations and the aforementioned will be sent within the week, after our Computing Center has had a chance to recover from a week of almost daily systems hand-ups and/or backlogs.

We felt that you would be anxious to see the results of your first study and would most likely make subgraphs from this print-out. We would be most interested in receiving Xerox copies of your subgraphs as this would help us to evaluate how well our program has served you. Again, we regret the short delay, but hope that this will occupy part of your time while waiting.

Sincerely,

John Wong, Jr.
Programmer, Taximetrics Lab.

JW:gm

5 November 1968

Mr. Kirby Brown
Department of Entomology
School of Agricultural Sciences
University of California
Riverside, Calif. 92592

Dear Mr. Brown:

Here is your last study. We are keeping one of your decks in case you want plots later. Unfortunately, we were not able to supply you with plots this time around because the Computing Center is in the middle of change from a slow Calcomp to a faster (or less slow) one.

We will be billing the account specified in your letter.

Sincerely yours,

John Wong, Jr.

JW:gm

[illegible]

* A standard cost form, IBAI activity 888157, is available for recording statements from this form.

*A standard cost form, IBM electronic BHR157, is available for searching statements from this form.

