Ana Schiavo

Understanding the Biospace: Large-Scale Survey & Classification of Halophilic Microorganisms

1
00:00:00,240 --> 00:00:10,839
[Music]

2
00:00:16,100 --> 00:00:12,890
hi good morning

3
00:00:18,260 --> 00:00:16,110
I'm a little nervous wolf because I'm

4
00:00:21,500 --> 00:00:18,270
Brazilian so English is not my mother

5
00:00:24,080 --> 00:00:21,510
language and also because I'm talking

6
00:00:29,090 --> 00:00:24,090
about other philic in the Salt Lake City

7
00:00:31,280 --> 00:00:29,100
it's kind of funny yeah okay sorry and

8
00:00:33,470 --> 00:00:31,290
the title of this presentation is

9
00:00:38,450 --> 00:00:33,480
understanding the bio space large-scale

10
00:00:40,759 --> 00:00:38,460
survey sorry in classifications of

11
00:00:44,090 --> 00:00:40,769
aliphatic microorganisms my name is ana

12
00:00:45,889 --> 00:00:44,100
paula Cabo and I'm from the Institute of

13
00:00:51,139 --> 00:00:45,899

chemistry in University of Sao Paulo in

14
00:00:55,399 --> 00:00:51,149
Brazil so I'm trying to introduce why

15
00:01:00,079 --> 00:00:55,409
this I started doing this survey I'm

16
00:01:02,899 --> 00:01:00,089
doing my PhD now and in this topic in

17
00:01:07,910 --> 00:01:02,909
your sphere that is the studies like the

18
00:01:12,250 --> 00:01:07,920
interaction of microorganisms with the

19
00:01:15,470 --> 00:01:12,260
earth and I work and make my

20
00:01:18,140 --> 00:01:15,480
experimental part of the project that I

21
00:01:19,490 --> 00:01:18,150
try to do like I delay I'll offer a low

22
00:01:22,430 --> 00:01:19,500
files and ready to learn

23
00:01:26,660 --> 00:01:22,440
from Brazilian soil like a Martian

24
00:01:28,430 --> 00:01:26,670
analog but also I'm doing this I'm

25
00:01:29,900 --> 00:01:28,440
trying to understand more above the

26
00:01:31,940 --> 00:01:29,910
other files and haja tolerance

27
00:01:34,580 --> 00:01:31,950
throughout the Tree of Life and trying

28
00:01:39,440 --> 00:01:34,590
to understand what our tolerance is a

29
00:01:44,720 --> 00:01:39,450
whole and I mean what do you know about

30
00:01:47,110 --> 00:01:44,730
these organisms like big picture so this

31
00:01:49,760 --> 00:01:47,120
is the part I'm going to talk about and

32
00:01:53,480 --> 00:01:49,770
just started the role if you know what

33
00:01:55,060 --> 00:01:53,490
is my space so the definition is a set

34
00:02:00,530 --> 00:01:55,070
of physical chemists and chemical

35
00:02:03,260 --> 00:02:00,540
conditions in which I can thrive so you

36
00:02:07,100 --> 00:02:03,270
have like a lot of these extremes that

37
00:02:09,139 --> 00:02:07,110
lisette's told us to and you have life

38
00:02:12,349 --> 00:02:09,149

until the limit here in all these

39
00:02:13,850 --> 00:02:12,359
extremes in in the meso fire condition

40
00:02:16,880 --> 00:02:13,860
that is not X

41
00:02:20,210 --> 00:02:16,890
in any sense you have more diversity and

42
00:02:23,270 --> 00:02:20,220
you have like microorganisms and all the

43
00:02:25,520 --> 00:02:23,280
animals of plants on other stuff and in

44
00:02:28,520 --> 00:02:25,530
the borders here you have more

45
00:02:32,810 --> 00:02:28,530
microorganisms living and also is the

46
00:02:36,080 --> 00:02:32,820
less diversity this is very interesting

47
00:02:40,310 --> 00:02:36,090
for us or biology because we can we know

48
00:02:42,710 --> 00:02:40,320
the buyer space of Earth we know the

49
00:02:45,199 --> 00:02:42,720
labors of life an orphan that's what we

50
00:02:49,100 --> 00:02:45,209
do with thermo files and we can compare

51
00:02:52,000 --> 00:02:49,110
these by space with other planetary

52
00:02:56,960 --> 00:02:52,010
bodies and moons so it's a very powerful

53
00:03:01,940 --> 00:02:56,970
tool for finding good places to look for

54
00:03:04,460 --> 00:03:01,950
life in the universe so for that the

55
00:03:06,260 --> 00:03:04,470
itsumo files are very interesting

56
00:03:08,630 --> 00:03:06,270
because we define the limits of the

57
00:03:11,810 --> 00:03:08,640
buyer space I'm not talking about that

58
00:03:14,540 --> 00:03:11,820
because it will be too much again and

59
00:03:17,420 --> 00:03:14,550
again but I have a lot of conditions and

60
00:03:21,680 --> 00:03:17,430
we can see the limits of life and we can

61
00:03:24,620 --> 00:03:21,690
think of survival on other planets I'm

62
00:03:27,440 --> 00:03:24,630
talking specifically specifically about

63
00:03:32,810 --> 00:03:27,450

Allah files that are the stop loving

64
00:03:36,170 --> 00:03:32,820
organisms on earth the tribe oceans

65
00:03:40,220 --> 00:03:36,180
lakes seas like something rates up like

66
00:03:43,100 --> 00:03:40,230
soil deserts and food especially food

67
00:03:46,670 --> 00:03:43,110
we've the they use salt for conservation

68
00:03:50,860 --> 00:03:46,680
and that's kind of normal so here's the

69
00:03:53,570 --> 00:03:50,870
Dead Sea that is like one of the first

70
00:03:56,690 --> 00:03:53,580
environments hyper silent environments

71
00:03:59,000 --> 00:03:56,700
and also this joke ow I don't know if

72
00:04:01,580 --> 00:03:59,010
I'm talking speaking sprite but is a

73
00:04:05,990 --> 00:04:01,590
Korean food that have a lot of South

74
00:04:09,080 --> 00:04:06,000
it's a like seafood and they had like

75
00:04:13,270 --> 00:04:09,090
more than ten microorganisms aliphatic

76
00:04:15,830 --> 00:04:13,280
microorganisms isolated from this food

77
00:04:18,590 --> 00:04:15,840
but anything in the solar system

78
00:04:20,630 --> 00:04:18,600
you have also very interesting things

79
00:04:24,440 --> 00:04:20,640
like Mars

80
00:04:27,680 --> 00:04:24,450
you have brines and reached south reach

81
00:04:30,550 --> 00:04:27,690
soil so weaving

82
00:04:37,150 --> 00:04:30,560
our files will be interesting to look at

83
00:04:42,770 --> 00:04:40,490
they are very diverse our files are very

84
00:04:45,680 --> 00:04:42,780
diverse they are present all three

85
00:04:48,830 --> 00:04:45,690
branches of life I think it's really

86
00:04:50,810 --> 00:04:48,840
funny because it was the same image that

87
00:04:54,290 --> 00:04:50,820
was that presented in the warm not to

88
00:04:57,440 --> 00:04:54,300

warm up talk and I want to really

89
00:05:00,770 --> 00:04:57,450
emphasize that they are polyphyletic so

90
00:05:03,710 --> 00:05:00,780
it evolved independently many in many

91
00:05:06,530 --> 00:05:03,720
times through the tree of life and they

92
00:05:10,760 --> 00:05:06,540
are various different mechanisms for the

93
00:05:14,930 --> 00:05:10,770
resistance so I think it's I think he

94
00:05:19,370 --> 00:05:14,940
thinks it will be important later they'd

95
00:05:24,710 --> 00:05:19,380
like to highlight these because people

96
00:05:26,900 --> 00:05:24,720
always are safe but always think that

97
00:05:30,290 --> 00:05:26,910
archaea are the historical files and

98
00:05:33,580 --> 00:05:30,300
ikea RDL files all the elephant's

99
00:05:36,350 --> 00:05:33,590
archaea but let's not rule we have

100
00:05:39,950 --> 00:05:36,360
actually the most part of alle files

101
00:05:43,340 --> 00:05:39,960
that we'd have described it are bacteria

102
00:05:46,690 --> 00:05:43,350
and i'm gonna show some interesting

103
00:05:53,659 --> 00:05:49,430
so this is a three or five point like

104
00:05:55,490 --> 00:05:53,669
more to think and has another i think

105
00:05:57,740 --> 00:05:55,500
it's very interesting information in

106
00:06:00,860 --> 00:05:57,750
here because you see that okay and

107
00:06:03,800 --> 00:06:00,870
archaea the in bacteria here but

108
00:06:07,490 --> 00:06:03,810
actually we know that this branch is

109
00:06:10,940 --> 00:06:07,500
almost as big as bacteria but we don't

110
00:06:14,659 --> 00:06:10,950
know as much as Archaean apparent as we

111
00:06:21,860 --> 00:06:14,669
know bacteria so this is a great bias in

112
00:06:23,690 --> 00:06:21,870
our data so again just to remember there

113
00:06:26,000 --> 00:06:23,700

is a classification for the other files

114
00:06:28,760 --> 00:06:26,010
depending on the salt concentration

115
00:06:33,530 --> 00:06:28,770
there is the tolerance they leave less

116
00:06:37,010 --> 00:06:33,540
than 0.2 molar and that's like moderate

117
00:06:39,420 --> 00:06:37,020
and extreme this was proposed like i

118
00:06:43,320 --> 00:06:39,430
think in the nineties when i'm not sure

119
00:06:48,029 --> 00:06:43,330
and ever since people are using this

120
00:06:51,990 --> 00:06:48,039
classification so the large-scale survey

121
00:06:54,450 --> 00:06:52,000
that I did was look for Allah files in

122
00:06:56,390 --> 00:06:54,460
the literature I searched for Allah

123
00:06:59,879 --> 00:06:56,400
philic in the International micro

124
00:07:02,510 --> 00:06:59,889
microbiology Society website and look

125
00:07:05,340 --> 00:07:02,520
for the papers that they had about that

126
00:07:08,070 --> 00:07:05,350
so I'm starting and not finished yet

127
00:07:10,529 --> 00:07:08,080
with the survey because I have to read

128
00:07:12,950 --> 00:07:10,539
all the papers to see the optimum growth

129
00:07:19,320 --> 00:07:12,960
and all those things so a lot of work I

130
00:07:23,820 --> 00:07:19,330
kind of starting my PhD so I had 3m 391

131
00:07:25,860 --> 00:07:23,830
papers and the information for all the

132
00:07:30,360 --> 00:07:25,870
threads are going to do they're going to

133
00:07:36,200 --> 00:07:30,370
be like fifties so I found on a some

134
00:07:39,140 --> 00:07:36,210
problems many papers they call the

135
00:07:42,900 --> 00:07:39,150
organisms out of files but they don't

136
00:07:45,540 --> 00:07:42,910
describe the the South concentration

137
00:07:50,939 --> 00:07:45,550
like they use total sows or cysts out

138
00:07:52,740 --> 00:07:50,949

and not and yes in HCL and there are

139
00:07:54,450 --> 00:07:52,750
many with incomplete description like

140
00:07:58,170 --> 00:07:54,460
they have the optimum but now the

141
00:08:03,510 --> 00:07:58,180
survival range or things like that so

142
00:08:07,640 --> 00:08:03,520
well of these we have for the optimum

143
00:08:10,680 --> 00:08:07,650
growth they have just three three three

144
00:08:15,020 --> 00:08:10,690
hundred thirty and for the survival

145
00:08:22,279 --> 00:08:18,899
so here is the histogram of all this

146
00:08:26,430 --> 00:08:22,289
information as you see we have three

147
00:08:28,920 --> 00:08:26,440
very distinct peaks with the three

148
00:08:31,200 --> 00:08:28,930
domains which is very interesting I

149
00:08:34,199 --> 00:08:31,210
think because they are really separated

150
00:08:36,769 --> 00:08:34,209
only here they archaea that have a

151
00:08:44,460 --> 00:08:36,779
little peak here but the other ones like

152
00:08:47,579 --> 00:08:44,470
just one one little range of salt that

153
00:08:50,130 --> 00:08:47,589
they do there are no growth at least in

154
00:08:53,310 --> 00:08:50,140
the literature so here you see they

155
00:08:56,769 --> 00:08:53,320
archaea that everyone thinks they are

156
00:08:58,420 --> 00:08:56,779
extremophiles and gravely Alafia yeah

157
00:09:01,900 --> 00:08:58,430
they are here in high salt

158
00:09:04,329 --> 00:09:01,910
concentrations but we see I think it's

159
00:09:08,730 --> 00:09:04,339
very interesting that the bacteria they

160
00:09:14,650 --> 00:09:08,740
are the optimum growth of them in like

161
00:09:17,590 --> 00:09:14,660
it appears more to the left here so it's

162
00:09:21,220 --> 00:09:17,600
lower self concentration than the okay

163
00:09:22,960 --> 00:09:21,230

idea other fires it's not what we use of

164
00:09:28,050 --> 00:09:22,970
the things because we don't actually

165
00:09:30,970 --> 00:09:28,060
look for much Alafaya dakari oats so

166
00:09:38,259 --> 00:09:30,980
kind of weird I don't know I thought it

167
00:09:39,819 --> 00:09:38,269
was very strange and here are the lines

168
00:09:42,550 --> 00:09:39,829
that are the concentrations for the

169
00:09:47,290 --> 00:09:42,560
classification I just said so here would

170
00:09:50,889 --> 00:09:47,300
be the slide moderate and extreme and I

171
00:09:53,500 --> 00:09:50,899
love files and with these see like most

172
00:09:57,460 --> 00:09:53,510
bacteria would be like slightly

173
00:09:59,800 --> 00:09:57,470
elephants and most archaea yolk area

174
00:10:03,160 --> 00:09:59,810
would be moderate Alafia and most

175
00:10:05,019 --> 00:10:03,170
archaea would be extreme Iowa files but

176
00:10:08,230 --> 00:10:05,029
we know that's not actually true

177
00:10:12,670 --> 00:10:08,240
we have much bacteria living in hyper

178
00:10:16,290 --> 00:10:12,680
selling environments so maybe it's a

179
00:10:19,150 --> 00:10:16,300
bias on what we are calling as a feeling

180
00:10:21,550 --> 00:10:19,160
bacteria or care what we are calling

181
00:10:27,610 --> 00:10:21,560
what we're you we are looking for

182
00:10:30,090 --> 00:10:27,620
bacteria or archaea so I think all the

183
00:10:33,970 --> 00:10:30,100
other feel like okay it's a moderate I

184
00:10:39,040 --> 00:10:33,980
don't know it's it's weird because he's

185
00:10:43,630 --> 00:10:39,050
here's a microalgae and it's study as a

186
00:10:46,300 --> 00:10:43,640
model organism for extremely Alafaya but

187
00:10:51,610 --> 00:10:46,310
it comes here in this classification as

188
00:10:54,600 --> 00:10:51,620

a moderate but I don't know I think it's

189
00:10:58,060 --> 00:10:54,610
I always I think it's really

190
00:11:01,090 --> 00:10:58,070
inconsistent the the information is

191
00:11:03,760 --> 00:11:01,100
inconsistent so I did the same thing

192
00:11:04,850 --> 00:11:03,770
with the survival range and obviously

193
00:11:17,570 --> 00:11:04,860
the

194
00:11:21,680 --> 00:11:17,580
concentration so if we compare that in a

195
00:11:23,509 --> 00:11:21,690
box what we see the its we couldn't

196
00:11:25,910 --> 00:11:23,519
compare this yeah okay the survival

197
00:11:29,030 --> 00:11:25,920
range is wider than the optimal growth

198
00:11:32,180 --> 00:11:29,040
that's expected and you know here see

199
00:11:34,579 --> 00:11:32,190
very clearly that in the the optimum

200
00:11:38,630 --> 00:11:34,589
growth in the survival range the Archaea

201
00:11:44,930 --> 00:11:38,640
are very high concentrations and back to

202
00:11:48,620 --> 00:11:44,940
your very low so some things I want to

203
00:11:54,319 --> 00:11:48,630
discuss is the historical bias of that

204
00:11:59,630 --> 00:11:54,329
because we have known bacteria for a lot

205
00:12:00,230 --> 00:11:59,640
of the time like and I hear not that

206
00:12:03,980 --> 00:12:00,240
much

207
00:12:07,400 --> 00:12:03,990
so the first contact was a hundred years

208
00:12:11,300 --> 00:12:07,410
later then with the first bacteria but

209
00:12:14,780 --> 00:12:11,310
we just started thinking of archaea as a

210
00:12:19,639 --> 00:12:14,790
different group from bacteria at last

211
00:12:21,800 --> 00:12:19,649
century so it's almost yesterday and the

212
00:12:26,900 --> 00:12:21,810
separation between these domains was

213
00:12:31,819 --> 00:12:26,910

with booze in the 90s so it's literally

214
00:12:36,530 --> 00:12:31,829
yesterday for the biology and so we

215
00:12:38,930 --> 00:12:36,540
studied much you said much bacteria and

216
00:12:42,350 --> 00:12:38,940
we know so much about them they living

217
00:12:45,199 --> 00:12:42,360
them as pathogens we are always using

218
00:12:48,350 --> 00:12:45,209
them and we know how to cultivate them

219
00:12:50,930 --> 00:12:48,360
and we don't in you know so you know of

220
00:12:53,720 --> 00:12:50,940
about archaea and we don't know how to

221
00:12:55,670 --> 00:12:53,730
cultivate them it's much more difficult

222
00:12:58,040 --> 00:12:55,680
to cultivate them we don't have the lab

223
00:13:01,850 --> 00:12:58,050
techniques we just don't know about that

224
00:13:06,680 --> 00:13:01,860
we can't deal with them so I think this

225
00:13:08,840 --> 00:13:06,690
is important historical bias for that

226
00:13:13,569 --> 00:13:08,850
information that we have about our files

227
00:13:18,519 --> 00:13:13,579
and another thing that is I think it's

228
00:13:24,439 --> 00:13:18,529
very much important like

229
00:13:28,910 --> 00:13:24,449
almost most unreasonable I think my

230
00:13:33,009 --> 00:13:28,920
hypothesis that people look for external

231
00:13:37,040 --> 00:13:33,019
fire Arceus because the first archaea

232
00:13:39,620 --> 00:13:37,050
discovered as I reckon archaea birthday

233
00:13:40,490 --> 00:13:39,630
was discovered in Yellowstone as a hyper

234
00:13:45,170 --> 00:13:40,500
terrified

235
00:13:49,569 --> 00:13:45,180
so since them since then we only search

236
00:13:53,660 --> 00:13:49,579
for IKEA in extremophiles environments

237
00:13:56,689 --> 00:13:53,670
so now we know that our tears are also

238
00:13:59,960 --> 00:13:56,699

in other places like in as a file and

239
00:14:02,150 --> 00:13:59,970
our stomach you know the places that we

240
00:14:06,550 --> 00:14:02,160
know that bacteria are but we just don't

241
00:14:11,930 --> 00:14:06,560
look for them in this places and this is

242
00:14:14,629 --> 00:14:11,940
twisting the the form we look to the bio

243
00:14:16,610 --> 00:14:14,639
space to signa form we know we are

244
00:14:18,530 --> 00:14:16,620
studying the alle files and not only the

245
00:14:21,980 --> 00:14:18,540
alibis I think this is the data I have

246
00:14:25,970 --> 00:14:21,990
but I think this goes on for a set of

247
00:14:27,610 --> 00:14:25,980
philic microorganisms and I don't know

248
00:14:30,530 --> 00:14:27,620
maybe even

249
00:14:35,259 --> 00:14:30,540
hyperthermophiles or by some secret

250
00:14:38,300 --> 00:14:35,269
files so we have to be very careful when

251
00:14:42,019 --> 00:14:38,310
what we are looking for and not to be

252
00:14:46,370 --> 00:14:42,029
like prejudiced about archaea or

253
00:14:49,429 --> 00:14:46,380
bacteria and actually see what's going

254
00:14:52,069 --> 00:14:49,439
on there and try to learn more about

255
00:14:56,929 --> 00:14:52,079
that here to know how to treat them and

256
00:14:59,720 --> 00:14:56,939
how to cultivate them so the

257
00:15:04,400 --> 00:14:59,730
consequences I think it's it's very

258
00:15:06,470 --> 00:15:04,410
disturbing for me I don't know if we

259
00:15:09,860 --> 00:15:06,480
have so much information about all of us

260
00:15:12,710 --> 00:15:09,870
as I think we have and how this

261
00:15:15,889 --> 00:15:12,720
information is biased information are

262
00:15:18,650 --> 00:15:15,899
twisting the limits of life are we

263
00:15:22,850 --> 00:15:18,660

losing some some more extremophiles

264
00:15:25,370 --> 00:15:22,860
limits of extremophiles are the limits

265
00:15:27,500 --> 00:15:25,380
are the boundaries of the bio space are

266
00:15:30,430 --> 00:15:27,510
further away and we just don't know

267
00:15:33,100 --> 00:15:30,440
because we are looking wrong word

268
00:15:37,980 --> 00:15:33,110
looking for the wrong microorganisms and

269
00:15:40,300 --> 00:15:37,990
we just don't see it and how these bias

270
00:15:43,180 --> 00:15:40,310
changes the understanding that we have

271
00:15:46,300 --> 00:15:43,190
about the life as a process because we

272
00:15:51,759 --> 00:15:46,310
have this prejudice in this we can twist

273
00:15:55,179 --> 00:15:51,769
a twist I see life as a whole and this

274
00:15:56,889 --> 00:15:55,189
is very disturbing for me and how this

275
00:16:00,639 --> 00:15:56,899
impacted is search of life on other

276
00:16:04,540 --> 00:16:00,649
planets also because of the bias pays

277
00:16:07,389 --> 00:16:04,550
the the awkward's BioSpace that have now

278
00:16:11,800 --> 00:16:07,399
so I don't know for me it's there this

279
00:16:15,040 --> 00:16:11,810
disturb me so that's it I'd like to

280
00:16:20,160 --> 00:16:15,050
thank you my uber thorium the University

281
00:16:32,939 --> 00:16:20,170
all the funding and Patience's and I

282
00:16:41,999 --> 00:16:37,269
thought just out of curiosity earlier

283
00:16:48,519 --> 00:16:44,559
relatively common salts like calcium

284
00:16:51,300 --> 00:16:48,529
sulfate usually that's interesting yeah

285
00:16:55,929 --> 00:16:51,310
some would definitely probably have more

286
00:16:59,230 --> 00:16:55,939
yeah yeah yeah actually these other

287
00:17:02,259 --> 00:16:59,240
salts usually appear just on archaea

288
00:17:05,500 --> 00:17:02,269

that's interesting as well not in

289
00:17:12,029 --> 00:17:05,510
bacteria and only recently the most

290
00:17:15,039 --> 00:17:12,039
recent papers not ancient one thank you

291
00:17:16,480 --> 00:17:15,049
great talk I was wondering if you could

292
00:17:17,799 --> 00:17:16,490
comment a bit on the different

293
00:17:22,359 --> 00:17:17,809
distributions

294
00:17:29,889 --> 00:17:22,369
you carry a bacteria why bacteria seem

295
00:17:33,940 --> 00:17:29,899
just it's so much yeah no sorry

296
00:17:37,930 --> 00:17:33,950
um why's bacteria like span the whole

297
00:17:41,529 --> 00:17:37,940
range and yeah because if you i feel go

298
00:17:43,989 --> 00:17:41,539
here in the box but you see that we have

299
00:17:47,169 --> 00:17:43,999
bacteria really high we know there are

300
00:17:50,349 --> 00:17:47,179
extremely other files bacteria living in

301
00:17:53,019 --> 00:17:50,359
like salt rocks with very low water

302
00:17:55,060 --> 00:17:53,029
activity so we know that bacteria can

303
00:17:59,019 --> 00:17:55,070
grow in all the environments that i've

304
00:18:02,859 --> 00:17:59,029
kyoto and grow like everyone that

305
00:18:05,619 --> 00:18:02,869
studies my files know the aloe archaea

306
00:18:09,219 --> 00:18:05,629
group but they back tears can leave just

307
00:18:14,079 --> 00:18:09,229
in the same environment but we look for

308
00:18:17,200 --> 00:18:14,089
bacteria in less south because because

309
00:18:19,839 --> 00:18:17,210
we look for bacteria near of us when we

310
00:18:23,349 --> 00:18:19,849
don't look for a cure of us we just look

311
00:18:27,579 --> 00:18:23,359
for a cure in extreme environments so I

312
00:18:29,799 --> 00:18:27,589
think this engagement here is actually

313
00:18:33,159 --> 00:18:29,809

because we were missing their key is

314
00:18:36,459 --> 00:18:33,169
here not because they are not bacterias

315
00:18:38,139 --> 00:18:36,469
here as well so you think it's the whole

316
00:18:45,190 --> 00:18:38,149
distribution you see is just a selection

317
00:18:52,090 --> 00:18:47,680
hey thank you for inspiring us all to

318
00:18:53,380 --> 00:18:52,100
read more Patriots I just carry since

319
00:18:55,660 --> 00:18:53,390
you did such an extensive literature

320
00:18:57,850 --> 00:18:55,670
here did you come across this kind of

321
00:18:59,890 --> 00:18:57,860
off-the-wall questions but like viruses

322
00:19:02,740 --> 00:18:59,900
predation on the bacteria or the

323
00:19:04,960 --> 00:19:02,750
halophiles in general I dunno that's

324
00:19:07,930 --> 00:19:04,970
thanks what are their like viruses

325
00:19:10,120 --> 00:19:07,940
present these extreme salty environments

326
00:19:18,910 --> 00:19:10,130
as well yeah I didn't look for it

327
00:19:21,840 --> 00:19:18,920
I asked you thank you oh this is a

328
00:19:25,540 --> 00:19:21,850
question more so as a comment okay um

329
00:19:27,190 --> 00:19:25,550
but so I also do some hella philic

330
00:19:29,440 --> 00:19:27,200
research on the Bonneville Salt Flats

331
00:19:31,600 --> 00:19:29,450
which is not the Great Salt Lake but

332
00:19:32,530 --> 00:19:31,610
sort of kind of tied in there with the

333
00:19:35,410 --> 00:19:32,540
Great Salt Lake a little bit because

334
00:19:36,760 --> 00:19:35,420
they're in a similar area but thought it

335
00:19:38,650 --> 00:19:36,770
was really interesting that you know

336
00:19:41,560 --> 00:19:38,660
that everybody always focuses on the

337
00:19:43,360 --> 00:19:41,570
hill archaea cuz you know you like who's

338
00:19:45,790 --> 00:19:43,370

writing my paper and yeah there's a ton

339
00:19:46,750 --> 00:19:45,800
mention about the hell are ya but one of

340
00:19:48,610 --> 00:19:46,760
the interesting things is they're all

341
00:19:50,620 --> 00:19:48,620
heterotrophic so like they have to be

342
00:19:52,630 --> 00:19:50,630
having somebody else making their food

343
00:19:54,190 --> 00:19:52,640
yeah and that's usually this algae I

344
00:19:59,200 --> 00:19:54,200
think that you mentioned is Joann Ellis

345
00:20:03,010 --> 00:19:59,210
oh yeah years that are a little files so

346
00:20:05,770 --> 00:20:03,020
yeah it's very interesting yeah and so I

347
00:20:07,720 --> 00:20:05,780
just yeah I really liked that you kind

348
00:20:09,160 --> 00:20:07,730
of like highlighted that the bacteria

349
00:20:12,760 --> 00:20:09,170
are really important in these ecosystems

350
00:20:15,610 --> 00:20:12,770
and that they're there I also noted in

351
00:20:17,410 --> 00:20:15,620
my own sort of I don't know if is your

352
00:20:19,270 --> 00:20:17,420
literature review that a lot of the

353
00:20:21,460 --> 00:20:19,280
sequencing methods for these things they

354
00:20:22,840 --> 00:20:21,470
just did like a really baseline 16s

355
00:20:25,690 --> 00:20:22,850
sequencing and it wasn't really deep

356
00:20:27,250 --> 00:20:25,700
enough to capture a good spread of the

357
00:20:30,810 --> 00:20:27,260
communities so I think you're absolutely

358
00:20:34,330 --> 00:20:30,820
right that we are missing a lot of these

359
00:20:36,580 --> 00:20:34,340
out there and even the sequencing we are

360
00:20:39,840 --> 00:20:36,590
much better as sequencing bacteria than

361
00:20:43,050 --> 00:20:39,850
we are referre Kea so probably we are

362
00:20:47,470 --> 00:20:43,060
missing much more they are keying this

363
00:20:49,330 --> 00:20:47,480

not so so so good sequencing

364
00:20:52,720 --> 00:20:49,340
environments or sequencing then we are

365
00:20:55,610 --> 00:20:52,730
missing bacteria so yeah I think it's

366
00:21:01,110 --> 00:20:58,080
okay if there are no further questions