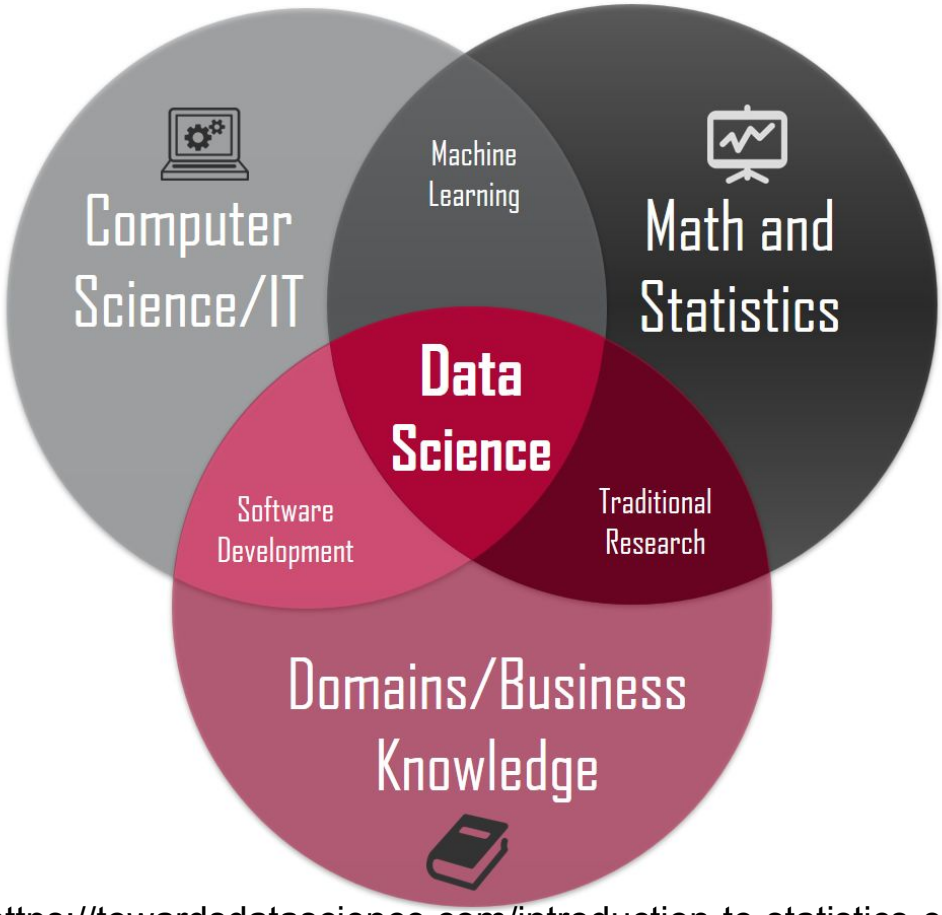

BSS
BIAŁOWIESKA SZKOŁA STATYSTYKI

Eksploracja danych



https://towardsdatascience.com/introduction-to-statistics-e9d72d818745

Po co?

poprawność

charakter danych

rozkłady

zależności

historia

Jak?

dowolnie

graficznie

intuicyjnie

Contents lists available at ScienceDirect

Urban Forestry & Urban Greening

journal homepage: www.elsevier.com/locate/ufug

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Original article

The utility of ancient forest indicator species in urban environments: A case study from Poznań, Poland

Marcin K. Dyderski[a,b], Jarosław Tyborski[c], Andrzej M. Jagodziński[a,b,*]

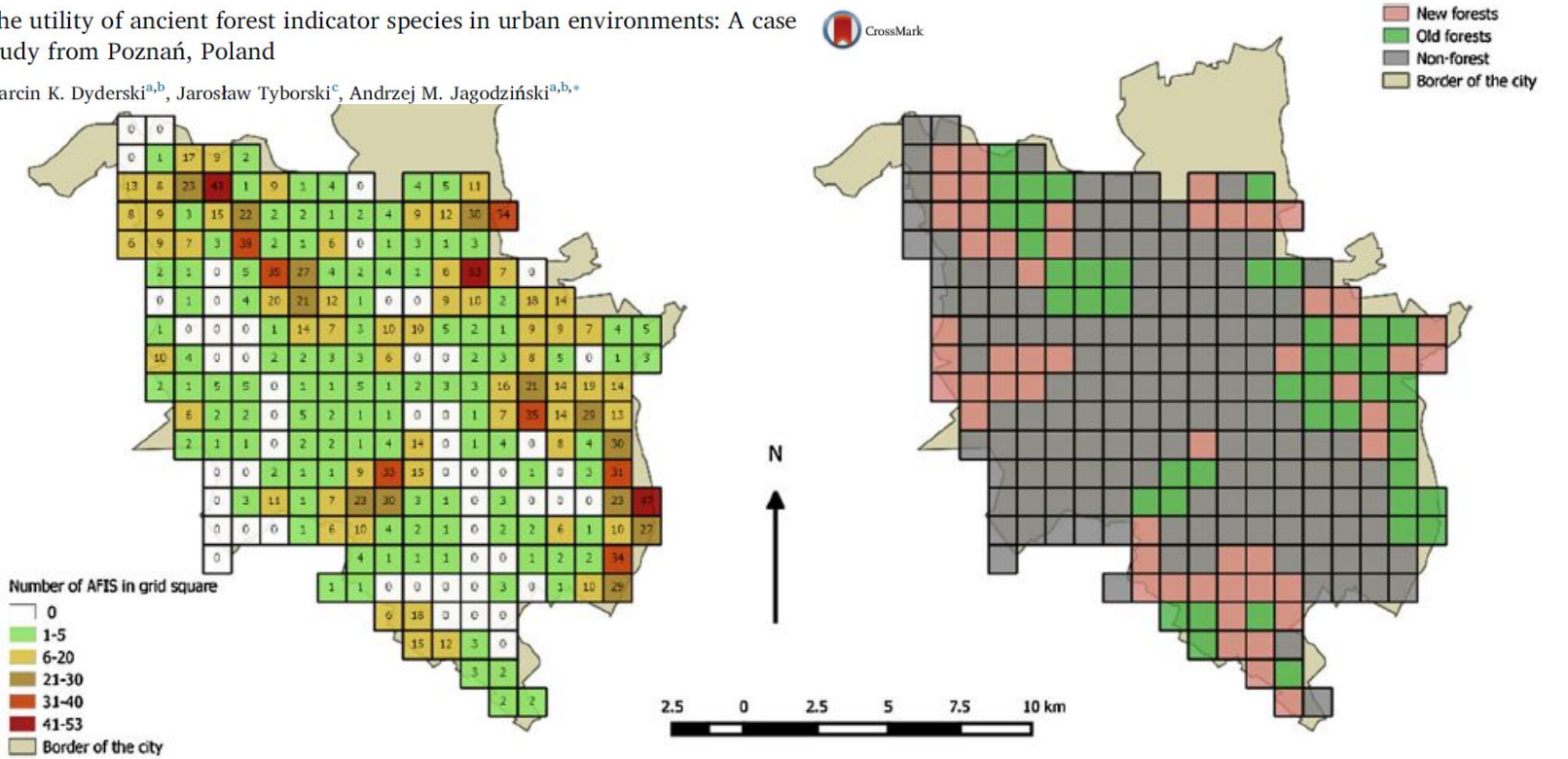


Fig. 3. Spatial distribution of ancient forest indicator species (AFIS) richness in experimental grid squares: 1–number of AFIS per square, 2–distribution of forest categories.

str()

```
str(eks)
'data.frame':  312 obs. of  24 variables:
 $ Species              : Factor w/ 312 levels "Acer campestre",..: 1 2 3 4 5 6 7 8 9 10
...
 $ hg                  : Factor w/ 5 levels "ap","arch","ef",..: 1 4 4 1 1 1 1 5 1 4 ...
 $ class                : Factor w/ 21 levels "0","aln","art vul",..: 14 1 1 14 14 10 3 14 3
1 ...
 $ stare.lasy           : int  0 0 0 0 0 0 0 1 1 0 ...
 $ L                   : int  5 NA 5 4 4 8 8 5 5 NA ...
 $ T                   : int  6 NA 6 6 NA NA 7 NA 5 NA ..
```

int - liczby całkowite

num - liczby rzeczywiste

factor - kategorie (uporządkowane)

chr - tekst

summary()

```
summary(eks)
                Species       hg          class
 Acer campestre      :  1   ap  :149   0      :60
 Acer ginnala        :  1   arch: 12   art vul:50
 Acer negundo        :  1   ef  :  2   que fag:50
 Acer platanoides    :  1   kn  : 37   mol arr:36
 Acer pseudoplatanus :  1   sp  :112   fes bro:15
 Achillea millefolium:  1              ste med:13
 (Other)             :306              (Other):88
```

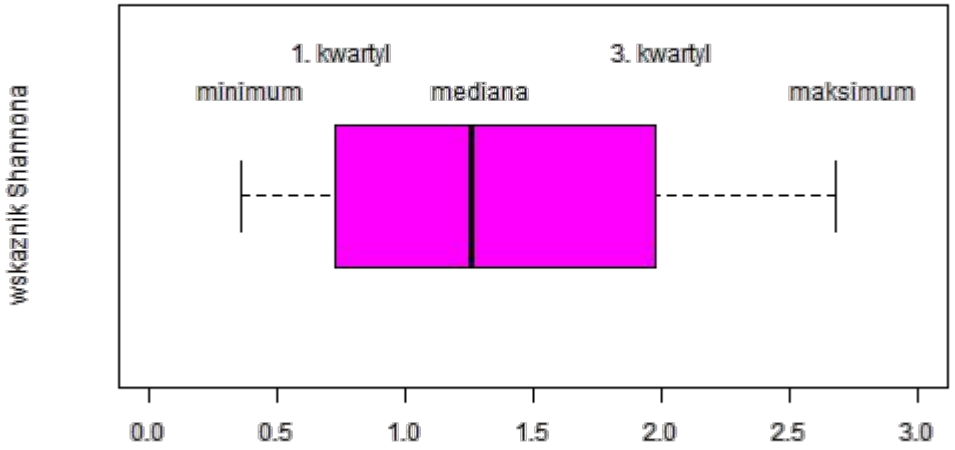
summary()

```
summary(eks)
       M               SR              N             wh_freq
 Min.   : 2.000   Min.   :1.00   Min.   :1.000   Min.   :-2.000
 1st Qu.: 4.000   1st Qu.:5.00   1st Qu.:3.000   1st Qu.:-1.859
 Median : 5.000   Median :7.00   Median :5.000   Median :-1.245
 Mean   : 5.108   Mean   :5.87   Mean   :5.149   Mean   :-1.193
 3rd Qu.: 6.000   3rd Qu.:7.00   3rd Qu.:7.000   3rd Qu.:-0.614
 Max.   :11.000   Max.   :9.00   Max.   :9.000   Max.   : 0.259
 NA's   :62       NA's   :120    NA's   :84      NA's   :53
```

Miary dyspersji a miary położenia

dyspersji - wariancja, SD, SE, rozstęp międzykwartylowy

położenia - średnia, mediana, moda



```
summary(eks$SLA)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
   4.75   18.01   23.89   25.06   29.04  144.78      54
```

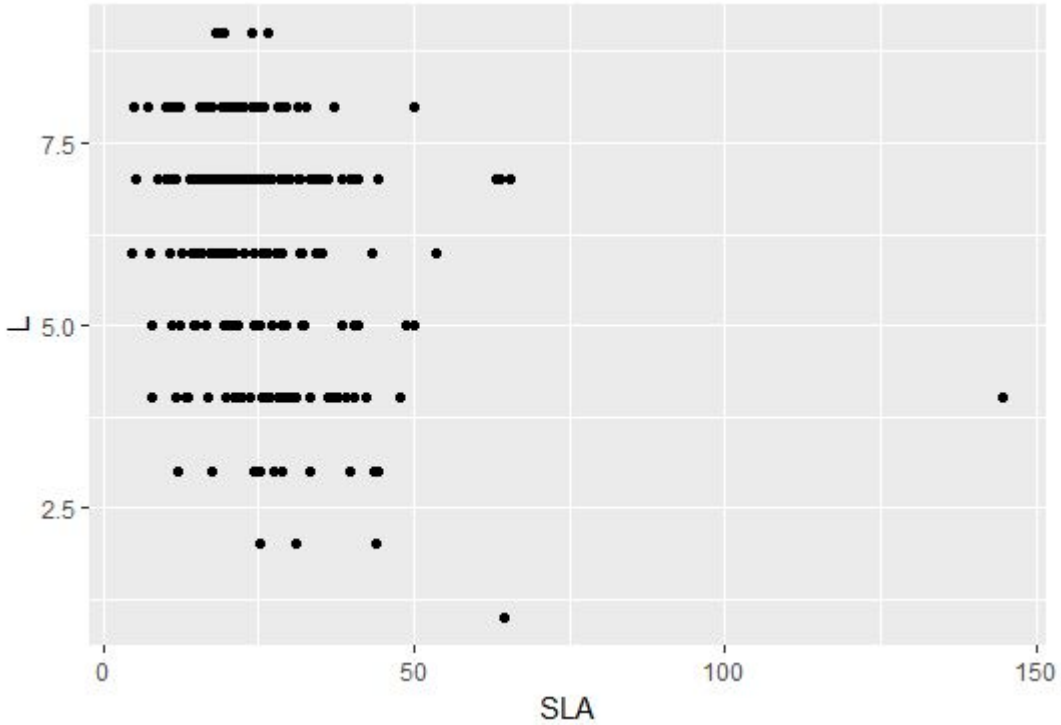
rozkład?

liczba braków danych?

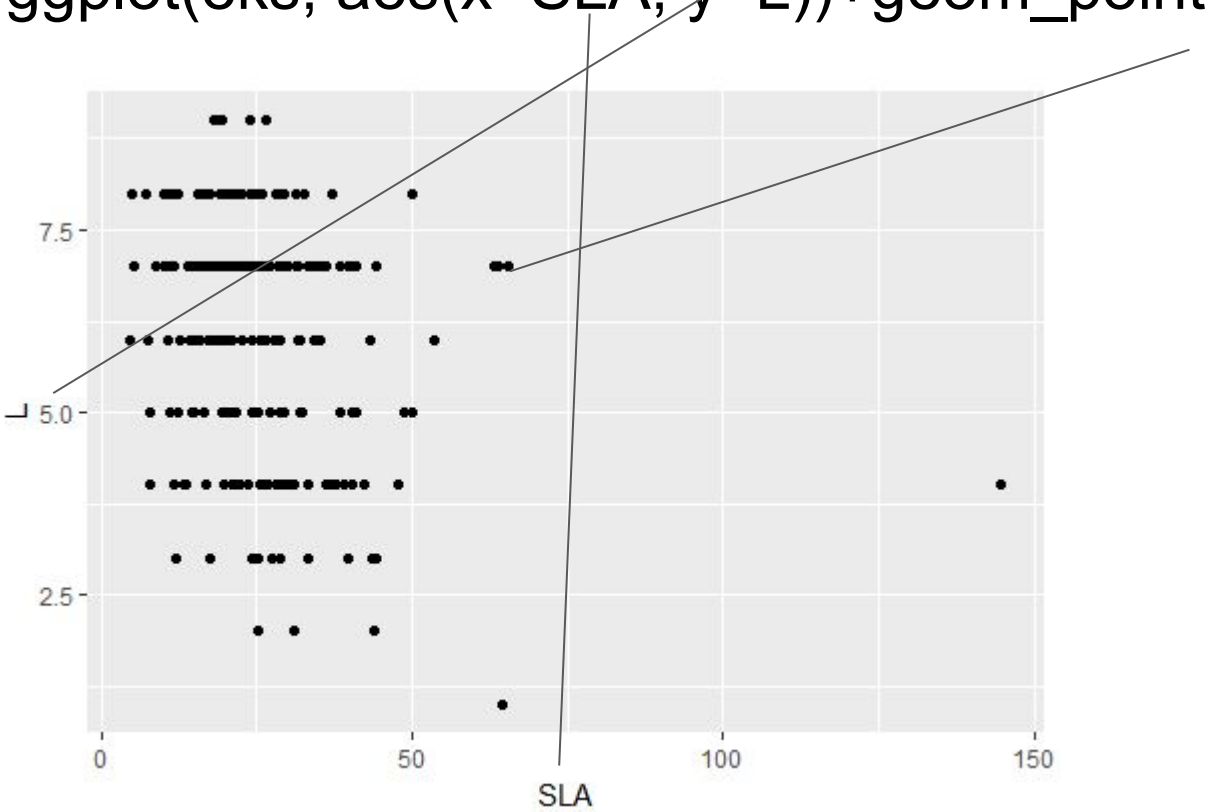
średnia?

Poprawność danych

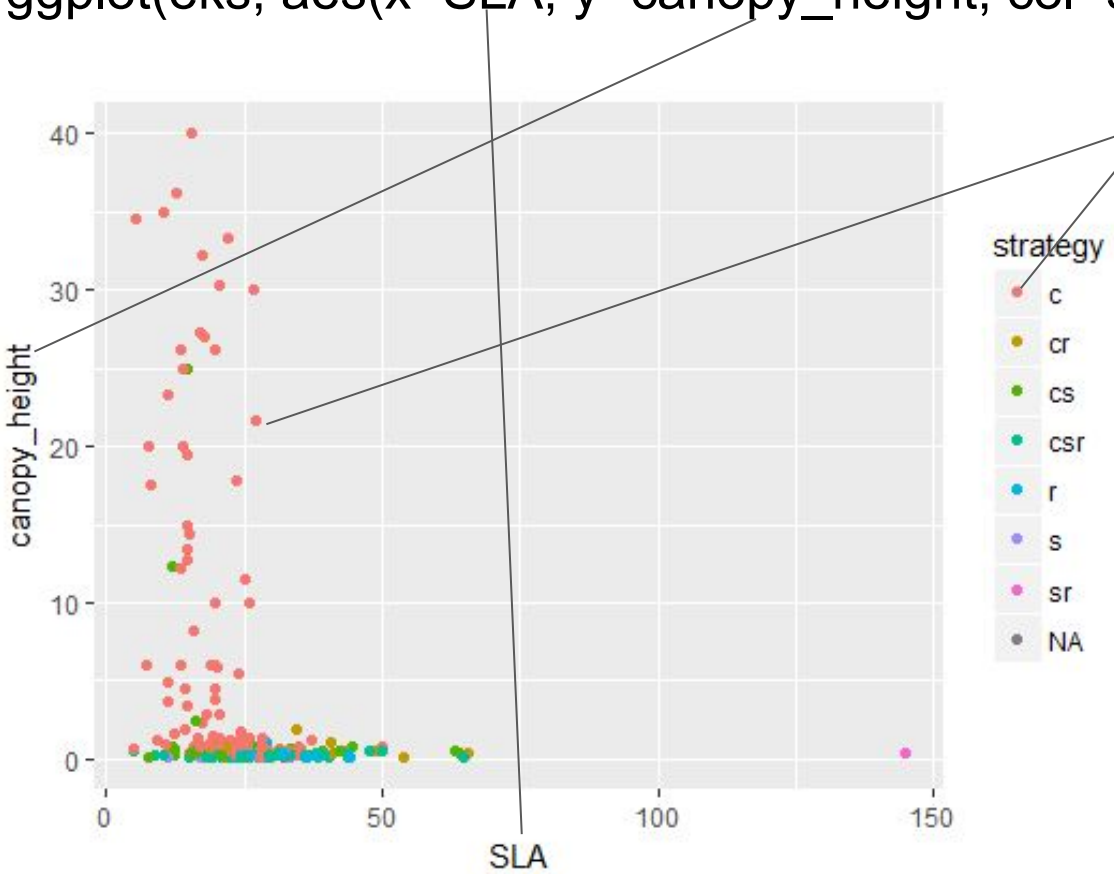
ggplot(eks, aes(x=SLA, y=L))+geom_point()



ggplot(eks, aes(x=SLA, y=L))+geom_point()



```
ggplot(eks, aes(x=SLA, y=canopy_height, col=strategy))+geom_point()
```



Filozofia ggplot

ggplot(dane, aes(zmienne))+elementy:

+geom_point() - punkty

+geom_col() - kolumny

+geom_smooth() - linie regresji

aes - aesthetics - elementy do pokazania na wykresach:

x,y - osie; col - kolor linii, fill - wypełnienie, shape - kształt, size...

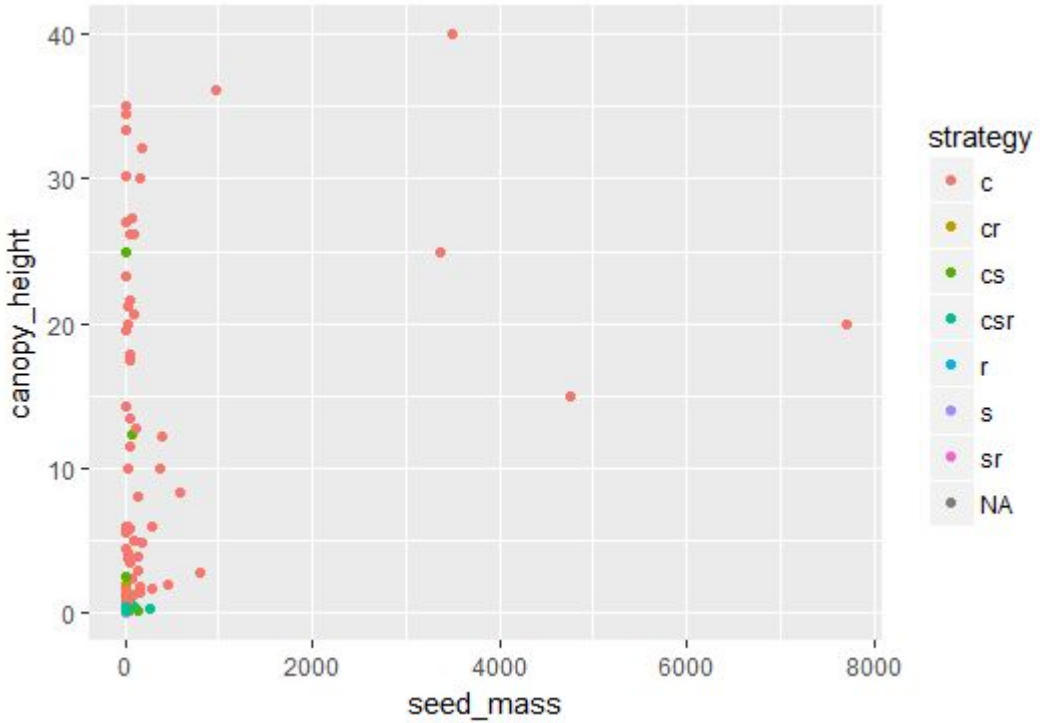
Bardzo dobra dokumentacja

http://ggplot2.tidyverse.org/index.html

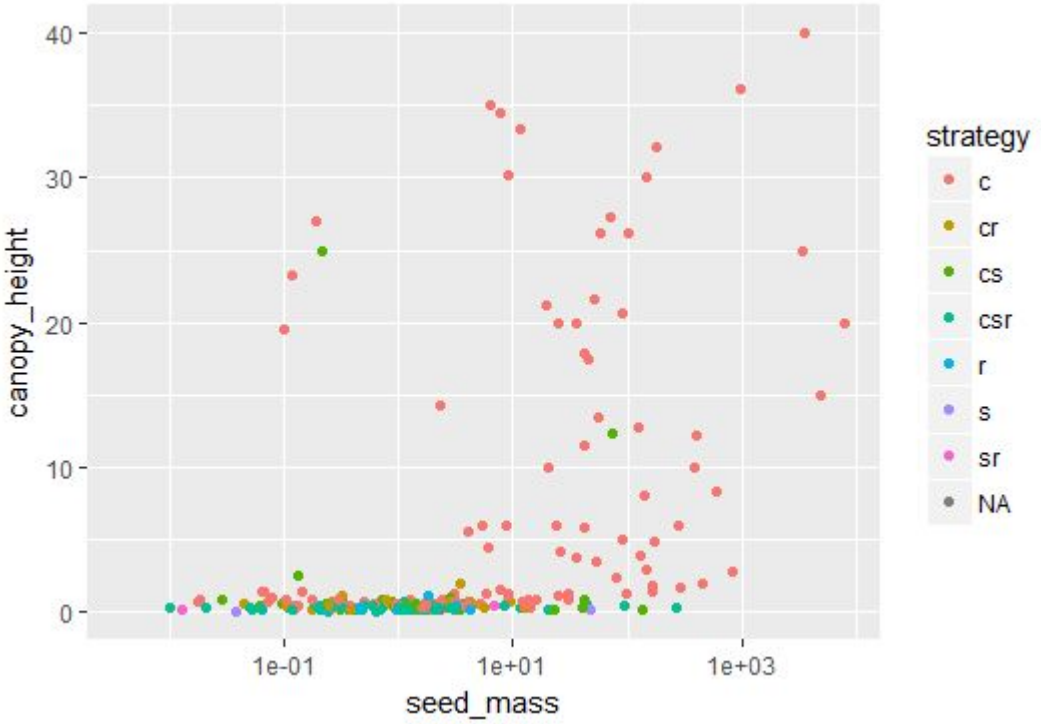
http://r-statistics.co/ggplot2-cheatsheet.html

https://www.rstudio.com/wp-content/uploads/2015/03/ggplot2-cheatsheet.pdf

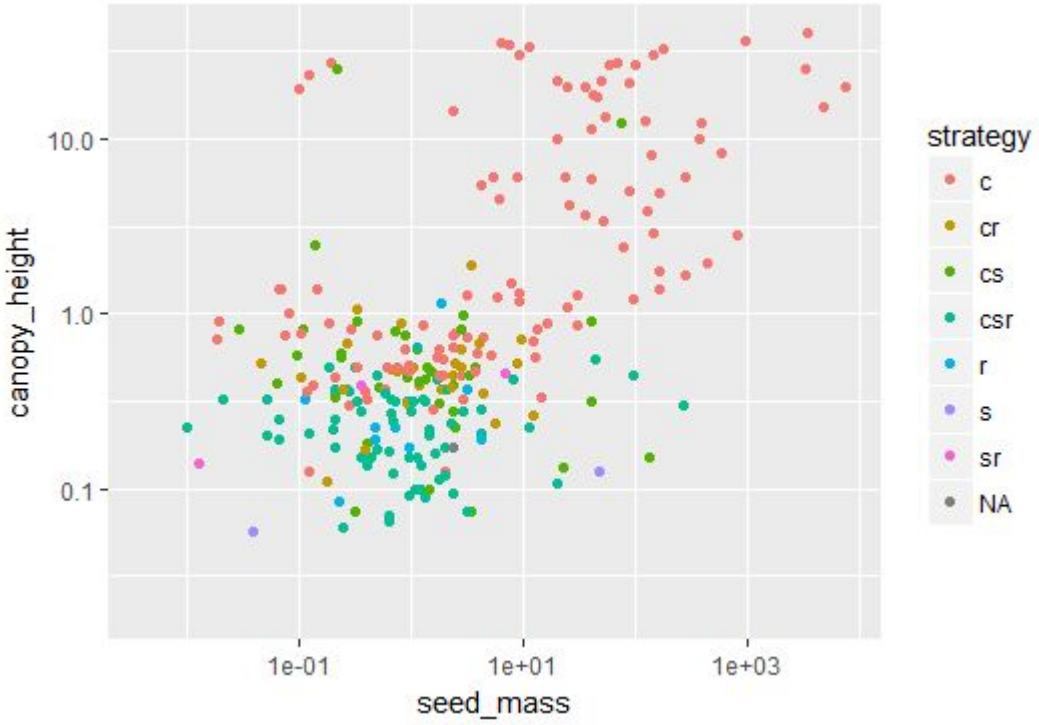
ggplot(eks, aes(x=seed_mass, y=canopy_height, col=strategy))+geom_point()



ggplot(eks, aes(x=seed_mass, y=canopy_height, col=strategy))+geom_point()**+scale_x_log10()**



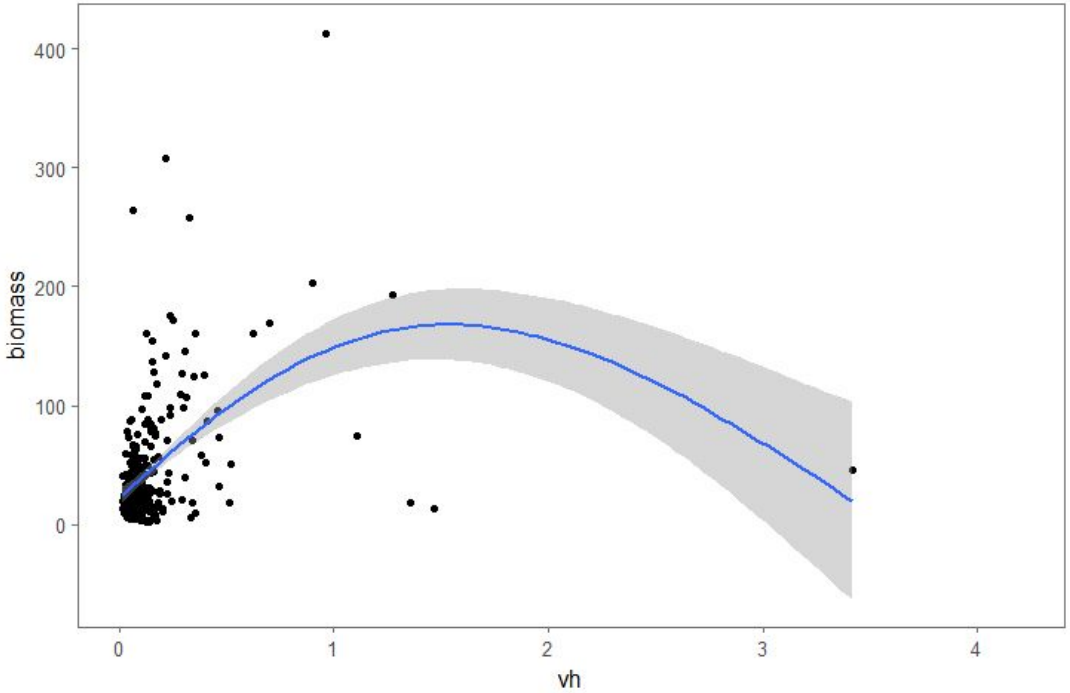
ggplot(eks, aes(x=seed_mass, y=canopy_height, col=strategy))+geom_point()**+scale_x_log10()+scale_y_log10()**



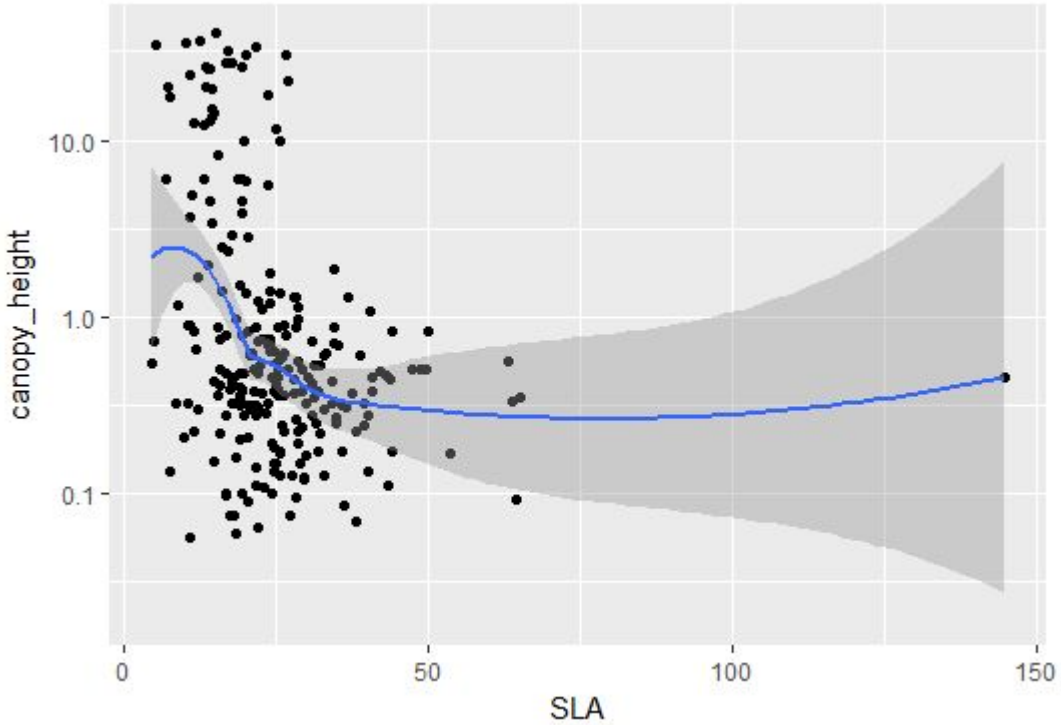
Poprawność danych

sprawdzamy

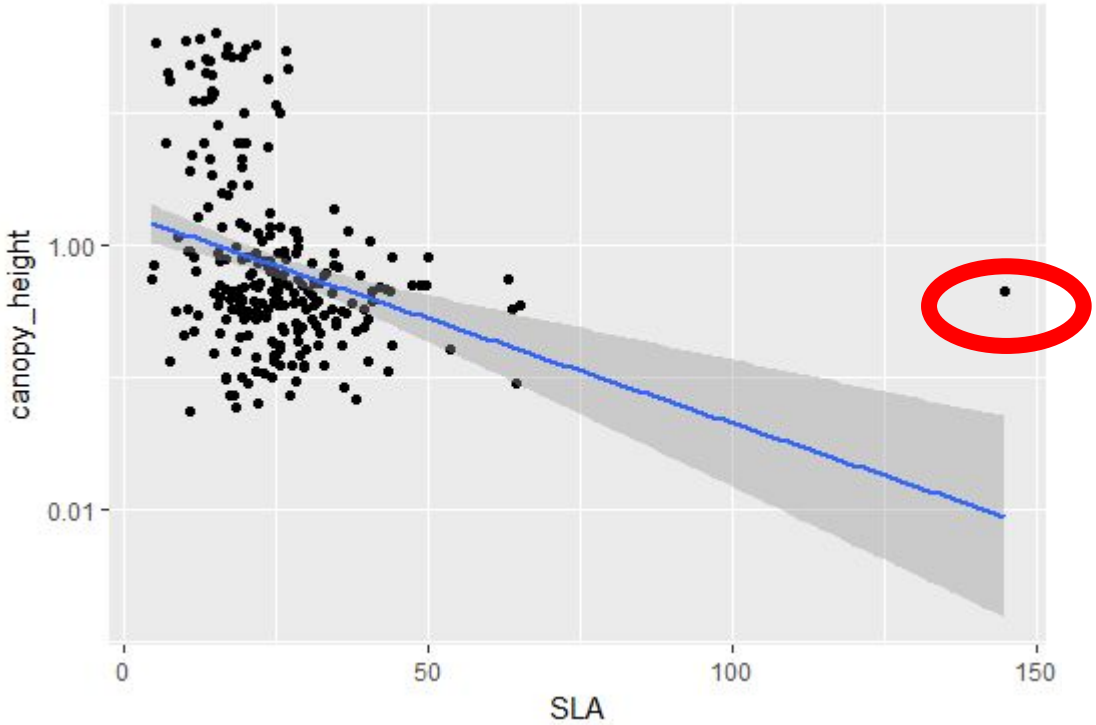
ggplot(dane, aes(x=vh,y=biomass)+geom_point()+geom_smooth()



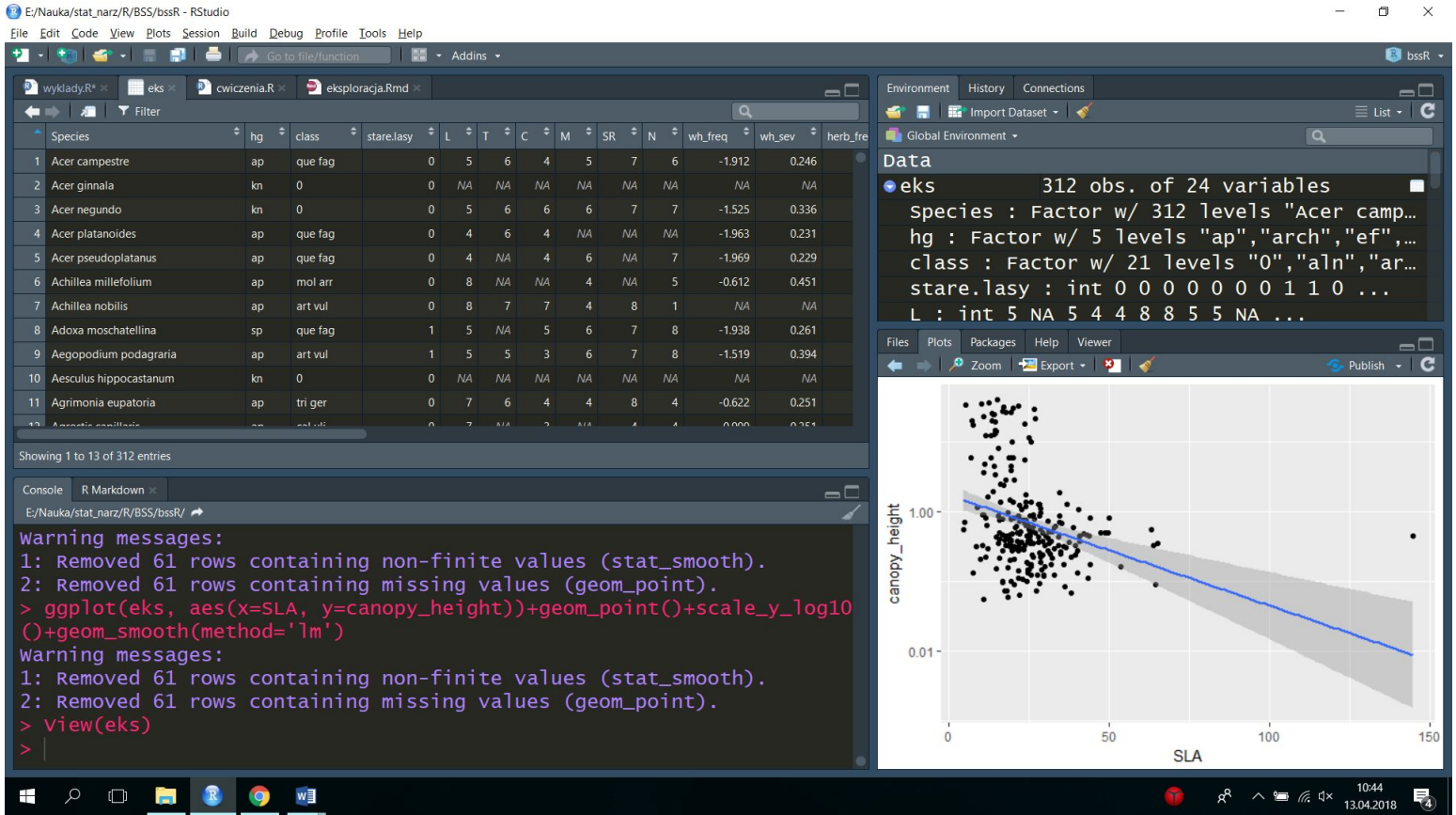
ggplot(eks, aes(x=SLA, y=canopy_height))+geom_point()
+scale_y_log10()**+geom_smooth()**



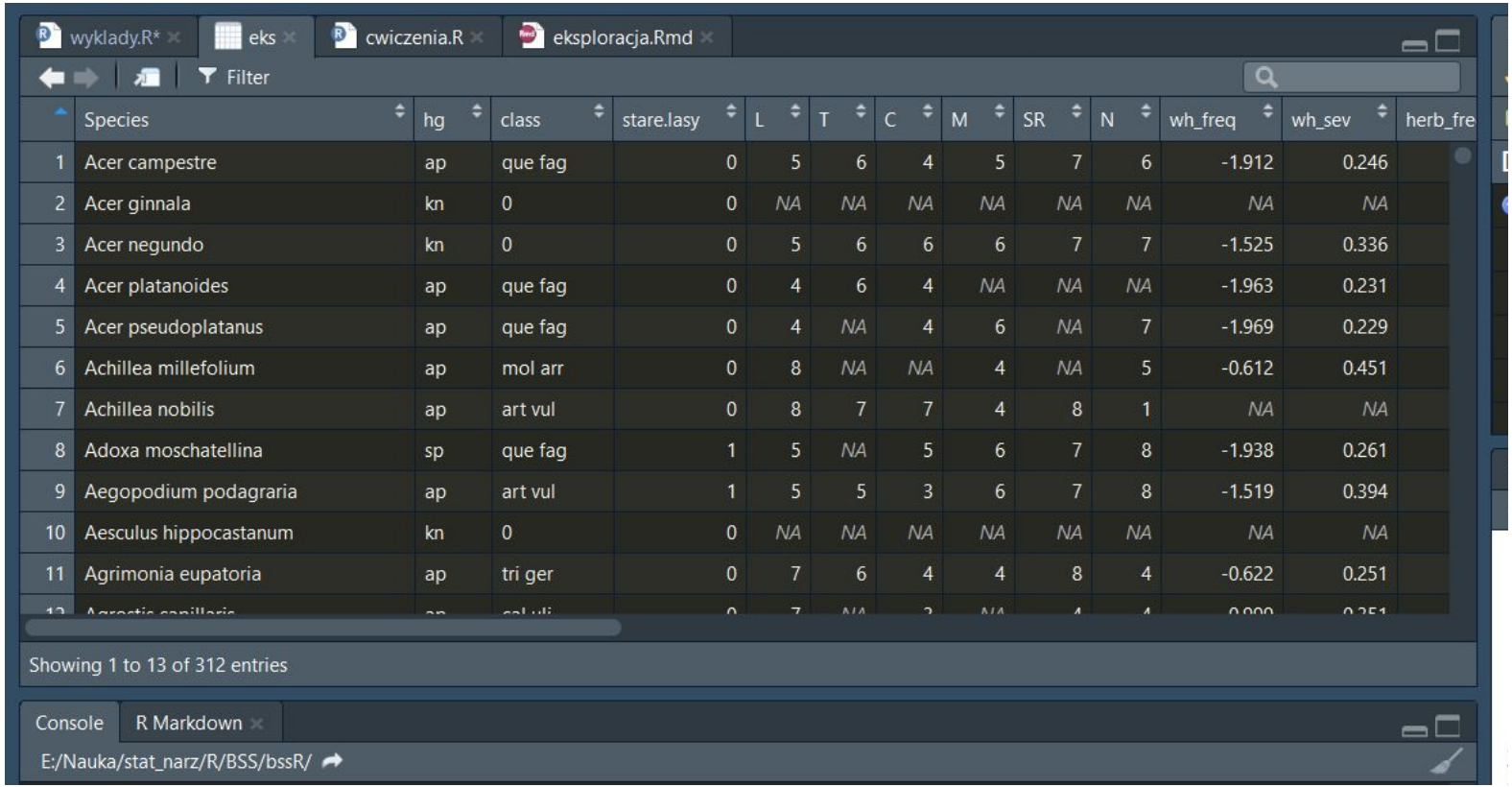
ggplot(eks, aes(x=SLA, y=canopy_height))+geom_point()
+scale_y_log10()**+geom_smooth(method='lm')**



co to jest za obserwacja?



co to jest za obserwacja?



wyklady.R* | eks | cwiczenia.R | eksploracja.Rmd

Filter

	Species	hg	class	stare.lasy	L	T	C	M	SR	N	wh_freq	wh_sev	herb_fre
1	Acer campestre	ap	que fag	0	5	6	4	5	7	6	-1.912	0.246	
2	Acer ginnala	kn	0	0	NA	NA	NA	NA	NA	NA	NA	NA	
3	Acer negundo	kn	0	0	5	6	6	6	7	7	-1.525	0.336	
4	Acer platanoides	ap	que fag	0	4	6	4	NA	NA	NA	-1.963	0.231	
5	Acer pseudoplatanus	ap	que fag	0	4	NA	4	6	NA	7	-1.969	0.229	
6	Achillea millefolium	ap	mol arr	0	8	NA	NA	4	NA	5	-0.612	0.451	
7	Achillea nobilis	ap	art vul	0	8	7	7	4	8	1	NA	NA	
8	Adoxa moschatellina	sp	que fag	1	5	NA	5	6	7	8	-1.938	0.261	
9	Aegopodium podagraria	ap	art vul	1	5	5	3	6	7	8	-1.519	0.394	
10	Aesculus hippocastanum	kn	0	0	NA	NA	NA	NA	NA	NA	NA	NA	
11	Agrimonia eupatoria	ap	tri ger	0	7	6	4	4	8	4	-0.622	0.251	
12	Agrostis capillaris	ap	sal uli	0	7	NA	3	NA	4	4	0.000	0.251	

Showing 1 to 13 of 312 entries

Console | R Markdown

E:/Nauka/stat_narz/R/BSS/bssR/

wyklady.R* | eks | cwiczenia.R | eksploracja.Rmd

Filter

leaf_mass	leaf_size	SLA	growth_form	seed_mass	seed_number_per_shoot	reprod_B	strategy
33.0250000	4675.00000	144.77500	Therophyte	6.8926667	2.030317e+03	s (by seed/by spore)	sr
8.3400000	*NA*	65.36000	Therophyte	4.4090000	7.027778e+04	s (by seed/by spore)	cr
7.6890571	806.00000	64.63000	Hemicryptophyte	0.9610000	7.655378e+02	sv (by seed and vegetatively)	csr
19.7466667	1048.00000	63.94000	Hemicryptophyte	0.2039500	6.923568e+05	sv (by seed and vegetatively)	cs
29.4000000	1814.75000	63.18000	Hemicryptophyte	0.2331636	9.385806e+03	sv (by seed and vegetatively)	cs
8.7462351	488.00000	53.68108	Therophyte	0.3852000	7.782644e+03	s (by seed/by spore)	cr
NA	*NA*	50.00000	Hemicryptophyte	13.5575000	1.625833e+04	s (by seed/by spore)	c
8.8386437	536.50000	49.90000	Hemicryptophyte	0.1817455	9.484508e+03	sv (by seed and vegetatively)	csr
98.9792285	4966.00000	48.73250	Hemicryptophyte	1.0212000	1.955248e+04	s (by seed/by spore)	cr
NA	*NA*	47.59239	Hemicryptophyte	0.3163200	7.208058e+03	s (by seed/by spore)	csr
20.4262209	3886.54545	44.35000	Hemicryptophyte	2.7852545	1.653929e+03	sv (by seed and vegetatively)	cs

Showing 1 to 13 of 312 entries

wyklady.R* | eks | cwiczenia.R | eksploracja.Rmd

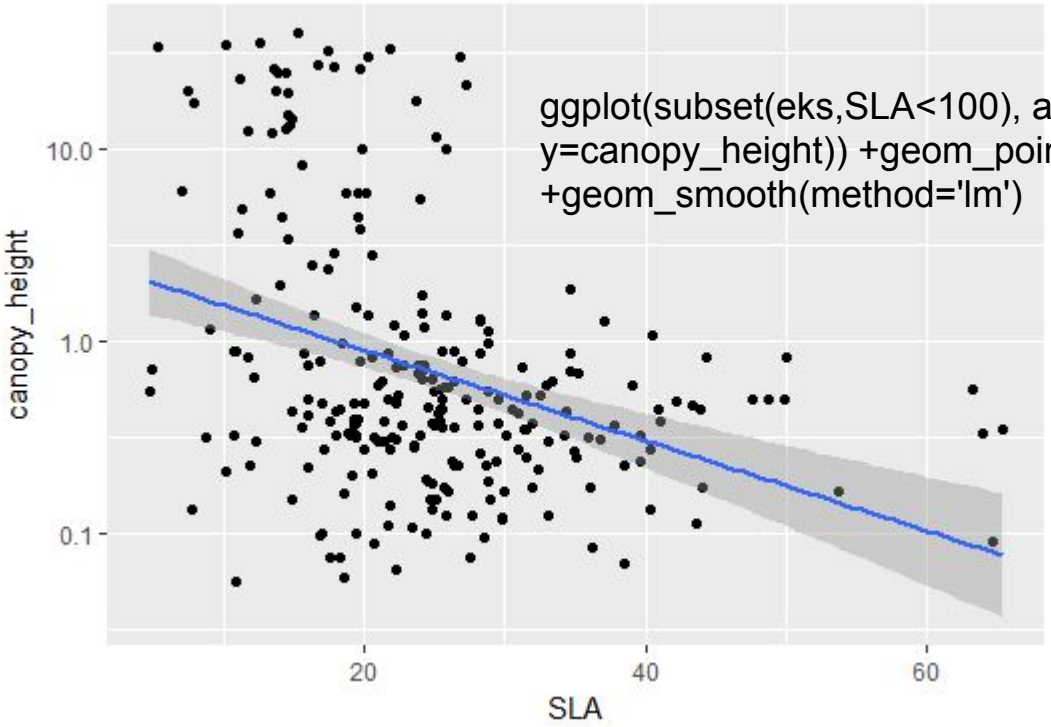
Filter

	Species	hg	class	stare.lasy	L	T	C	M	SR	N	wh_freq	wh_sev	herb_f
147	Impatiens parviflora	kn	art vul	0	4	6	5	5	NA	6	-1.700	0.347	
122	Galeopsis pubescens	ap	art vul	0	7	5	4	5	NA	6	-1.697	0.451	
189	Oxalis acetosella	sp	0	1	1	NA	3	5	4	6	-1.914	0.275	
186	Myosoton aquaticum	ap	art vul	0	7	5	3	8	7	8	-1.001	0.474	
168	Lycopus europaeus	ap	aln	0	7	6	5	9	7	7	-0.971	0.249	
278	Stellaria media	ap	ste med	0	6	NA	NA	NA	7	8	-0.877	0.858	
24	Arctium tomentosum	ap	art vul	0	8	5	7	5	8	9	-0.576	0.655	
210	Poa nemoralis	ap	que fag	1	5	NA	5	5	5	4	-1.871	0.282	
156	Lapsana communis	ap	art vul	0	5	6	3	5	NA	7	-1.222	0.776	
185	Mycelis muralis	sp	art vul	1	4	6	2	5	NA	6	-1.941	0.271	
43	Brachypodium sylvaticum	sp	que fag	1	3	5	3	5	6	6	-1.864	0.290	
217	Polygonum minus	ap	bid	0	7	6	2	8	5	8	0.000	0.217	

Showing 1 to 13 of 312 entries

Błąd czy nie błąd?

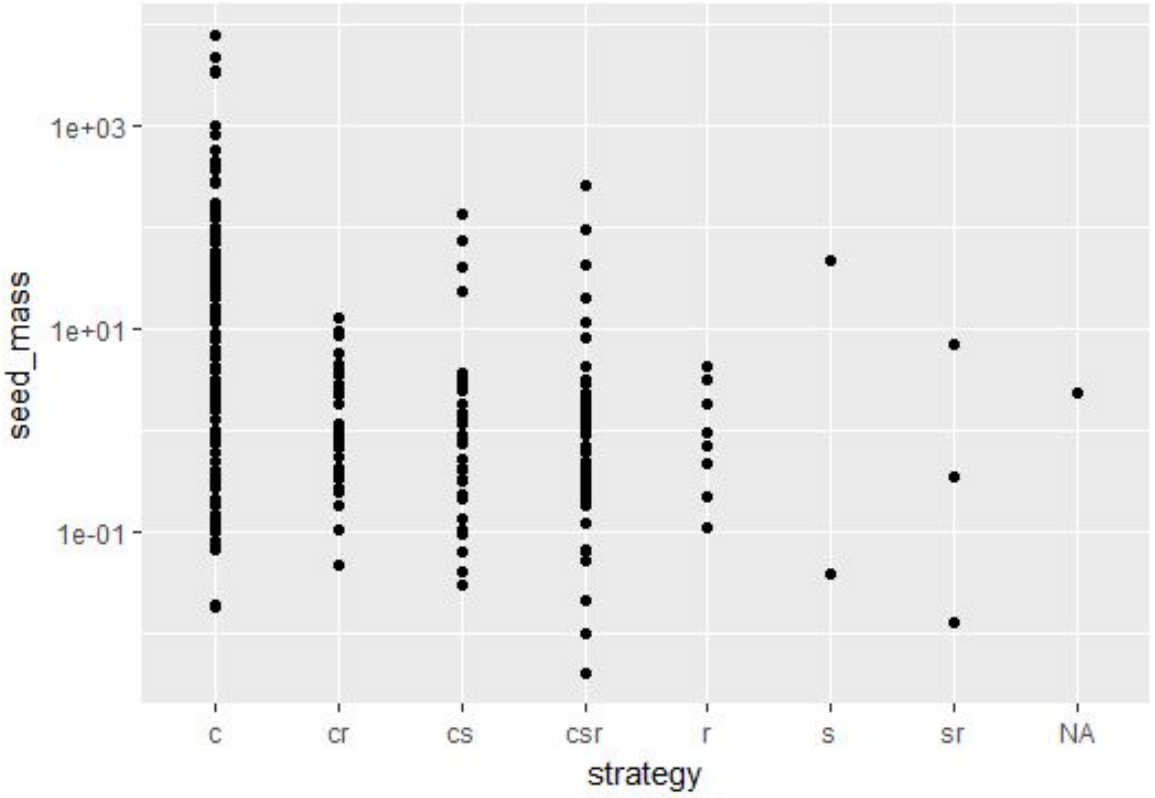
Co by było gdyby?



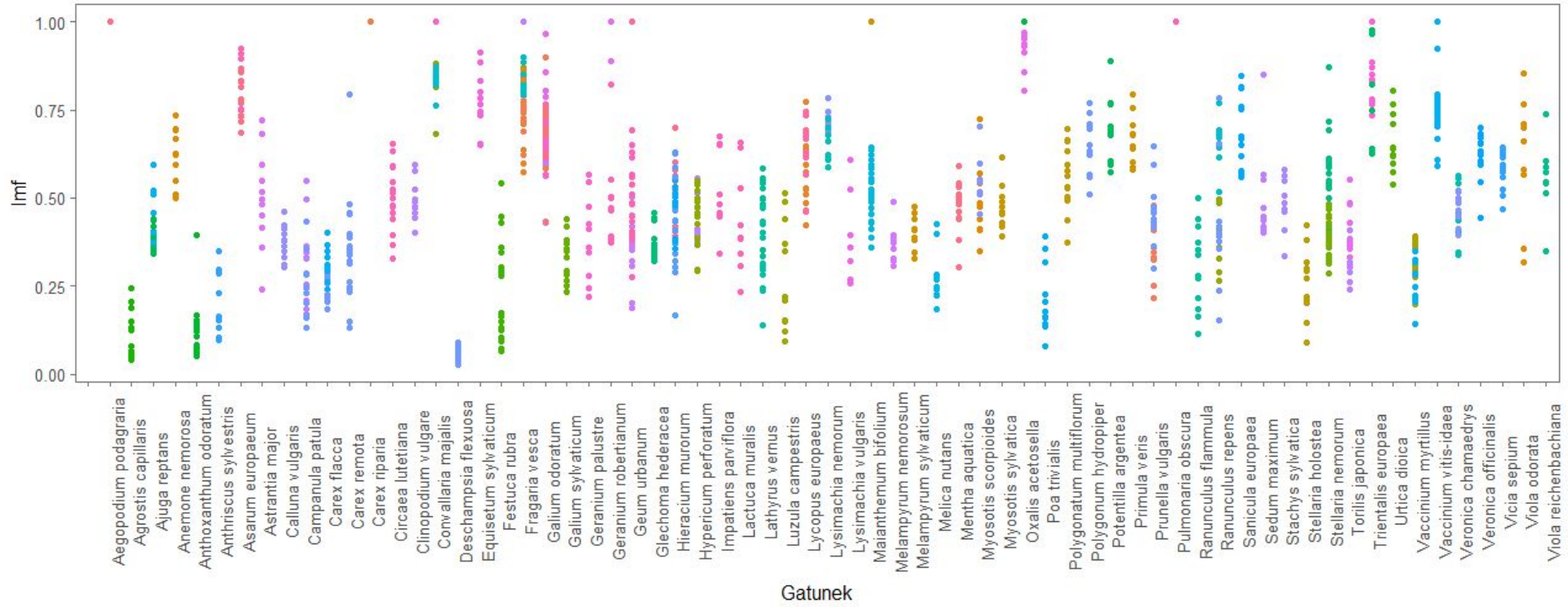

```
ggplot(subset(eks,SLA<100), aes(x=SLA,
y=canopy_height)) +geom_point()+scale_y_log10()
+geom_smooth(method='lm')
```

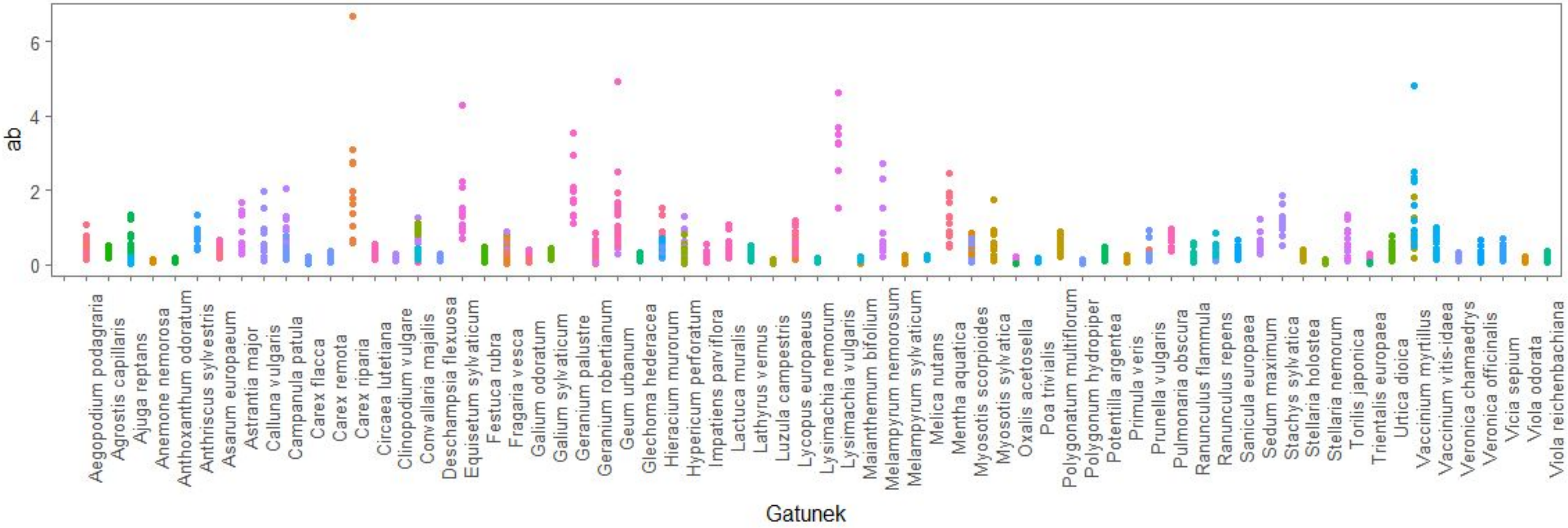
Grupy

```
ggplot(eks, aes(x=strategy, y=seed_mass))
+geom_point()+scale_y_log10()
```



```
ggplot(baza, aes(x=Gatunek,col=Kod.miejsca,
y=lmf,label=Kod))+geom_point()+theme_few()+theme(axis.text.x=element_text(an
gle=90),legend.position='null')
```





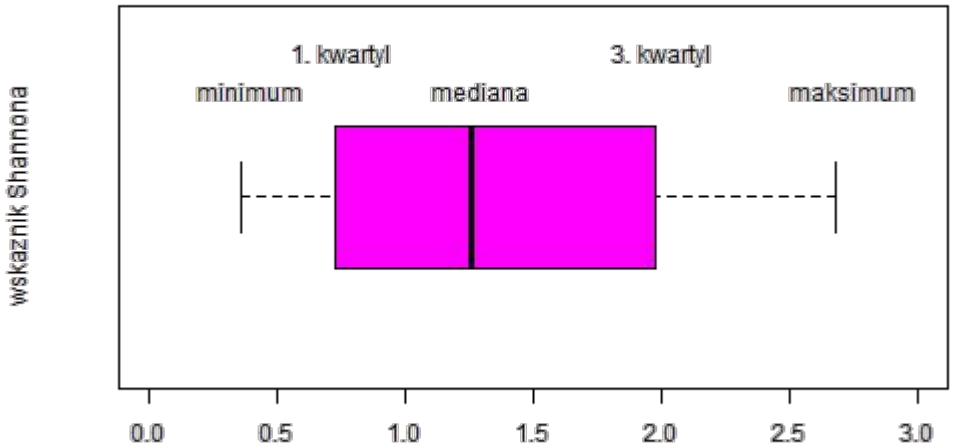
ab
0
2
4
6
Gatunek
Aegopodium podagraria
Agrostis capillaris
Ajuga reptans
Anemone nemorosa
Anthoxanthum odoratum
Anthriscus sylvestris
Asarum europaeum
Astrantia major
Calluna vulgaris
Campanula patula
Carex flacca
Carex remota
Carex riparia
Circaea lutetiana
Clinopodium vulgare
Convallaria majalis
Deschampsia flexuosa
Equisetum sylvaticum
Festuca rubra
Fragaria vesca
Galium odoratum
Galium sylvaticum
Geranium palustre
Geranium robertianum
Geum urbanum
Glechoma hederacea
Hieracium murorum
Hypericum perforatum
Impatiens parviflora
Lactuca muralis
Lathyrus vernus
Luzula campestris
Lycopus europaeus
Lysimachia nemorum
Lysimachia vulgaris
Maianthemum bifolium
Melampyrum nemorosum
Melampyrum sylvaticum
Melica nutans
Mentha aquatica
Myosotis scorpioides
Myosotis sylvatica
Oxalis acetosella
Poa trivialis
Polygonatum multiflorum
Polygonum hydropiper
Potentilla argentea
Primula veris
Prunella vulgaris
Pulmonaria obscura
Ranunculus flammula
Ranunculus repens
Sanicula europaea
Sedum maximum
Stachys sylvatica
Stellaria holostea
Stellaria nemorum
Torilis japonica
Trientalis europaea
Urtica dioica
Vaccinium myrtillus
Vaccinium vitis-idaea
Veronica chamaedrys
Veronica officinalis
Vicia sepium
Viola odorata
Viola reichenbachiana

Rozkład

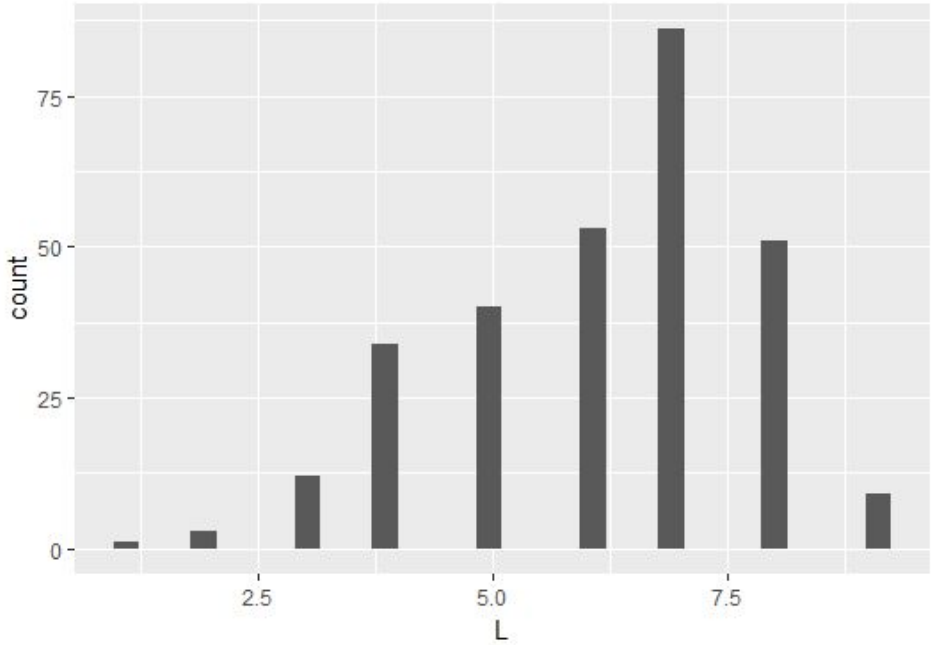
jak wyglądają dane?

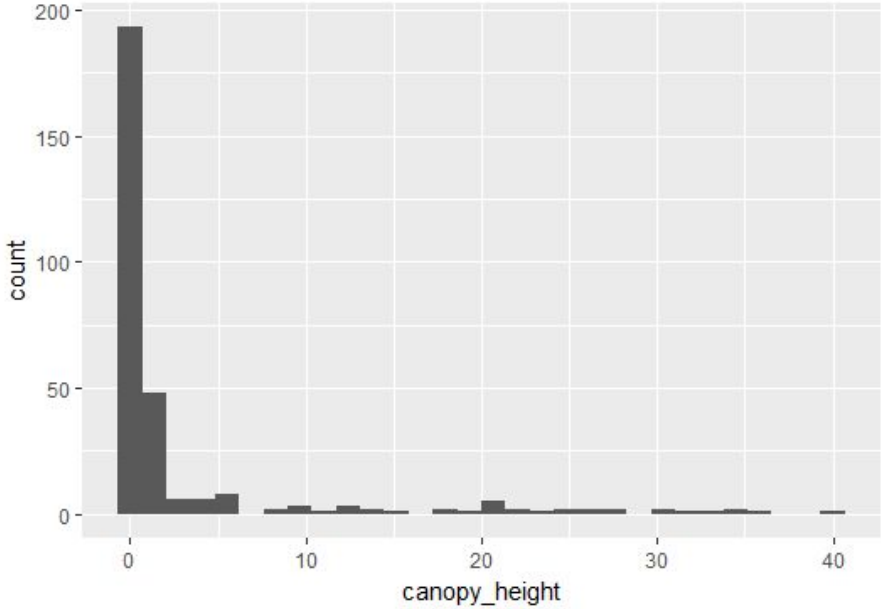
jak się **rozkładają** gdy je ułożyć w kolejności?

Boxplot i summary



Histogram

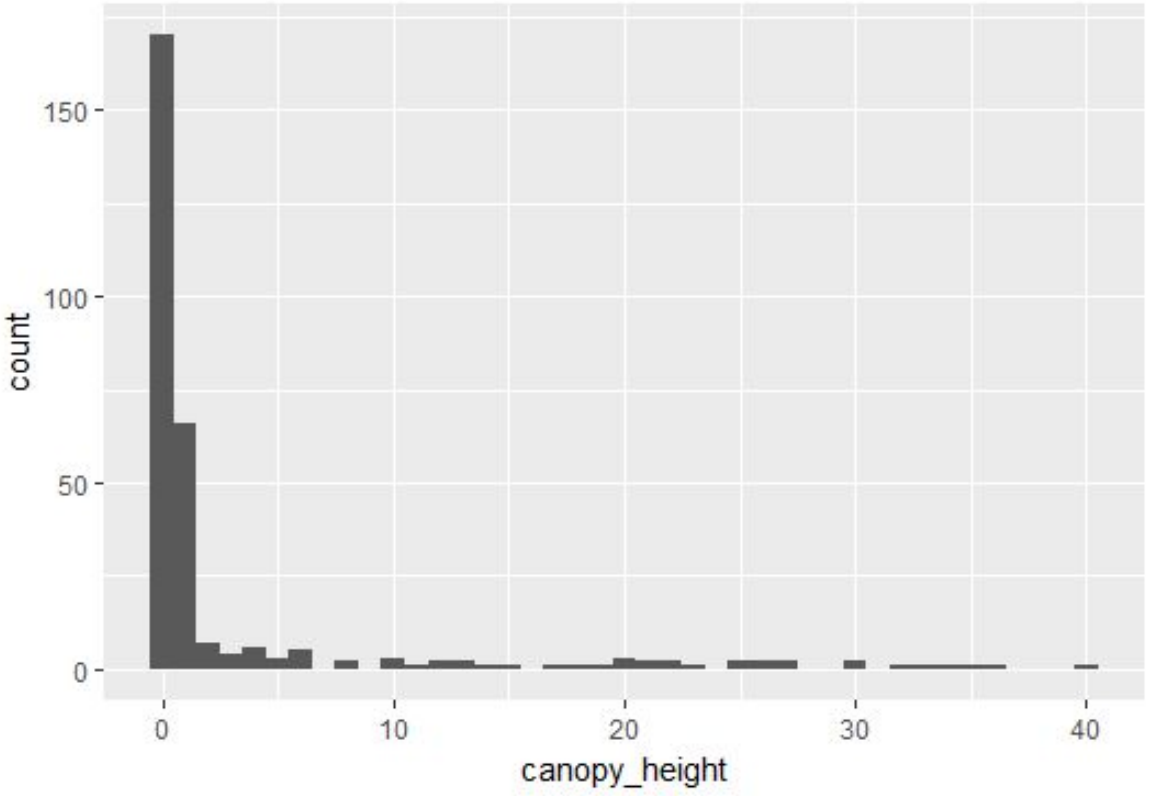

75
50
25
0
count
2.5
5.0
7.5
L


200
150
100
50
0
count
0
10
20
30
40
canopy_height

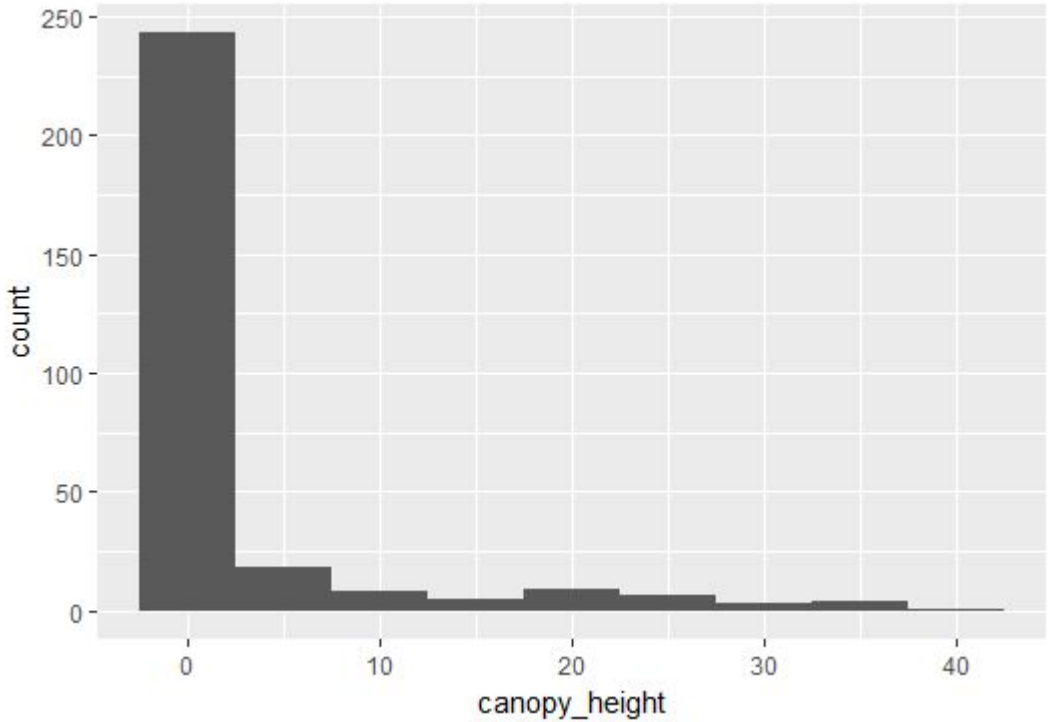
ggplot(eks, aes(x=M))+geom_histogram()

geom_histogram(binwidth=...)

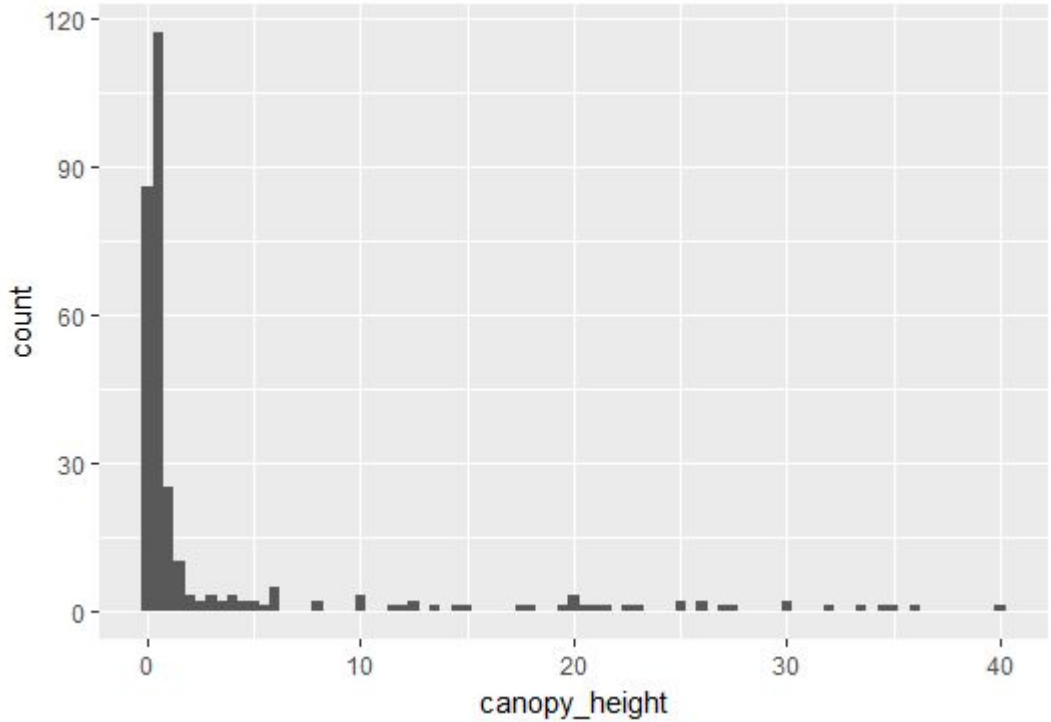
ggplot(eks, aes(x=canopy_height))+geom_histogram(binwidth = 1)



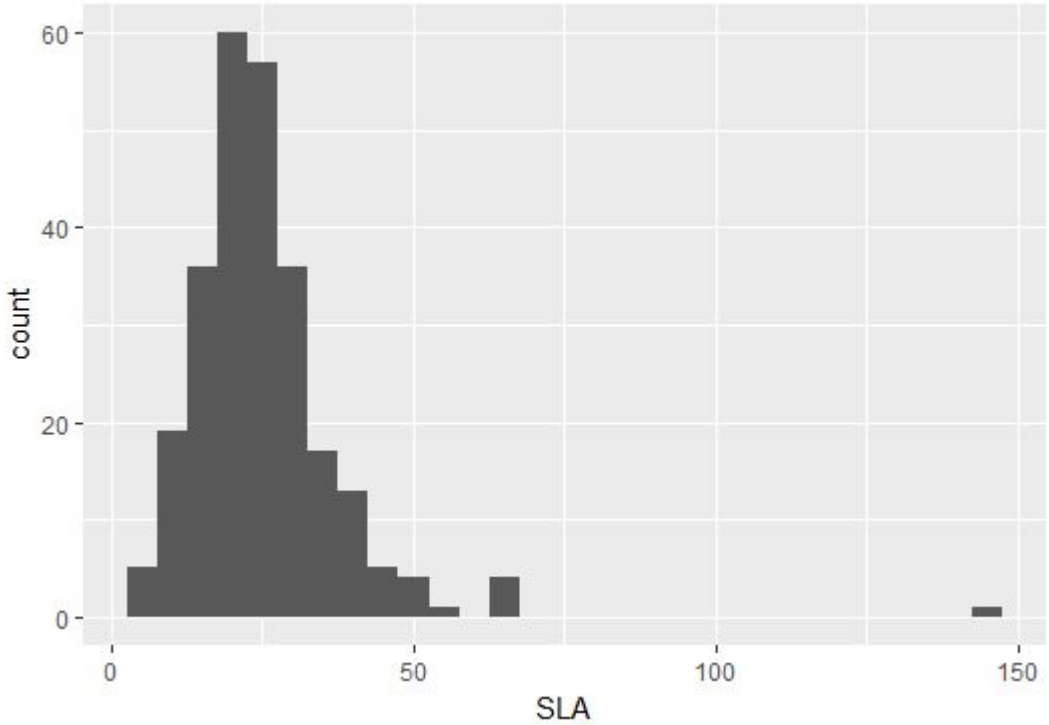
ggplot(eks, aes(x=canopy_height))+geom_histogram(binwidth = 5)



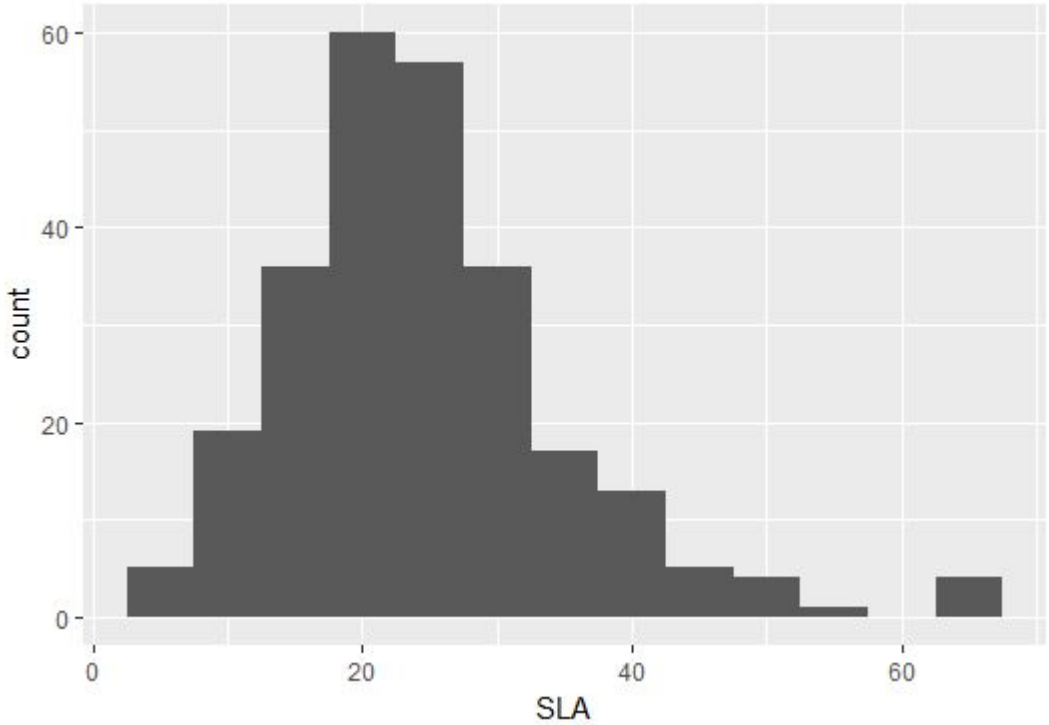
ggplot(eks, aes(x=canopy_height))+geom_histogram(binwidth = .5)



ggplot(eks, aes(x=SLA))+geom_histogram(binwidth = 5)



```
ggplot(subset(eks,SLA<100), aes(x=SLA))+geom_histogram(binwidth = 5)
```



Typy rozkładów

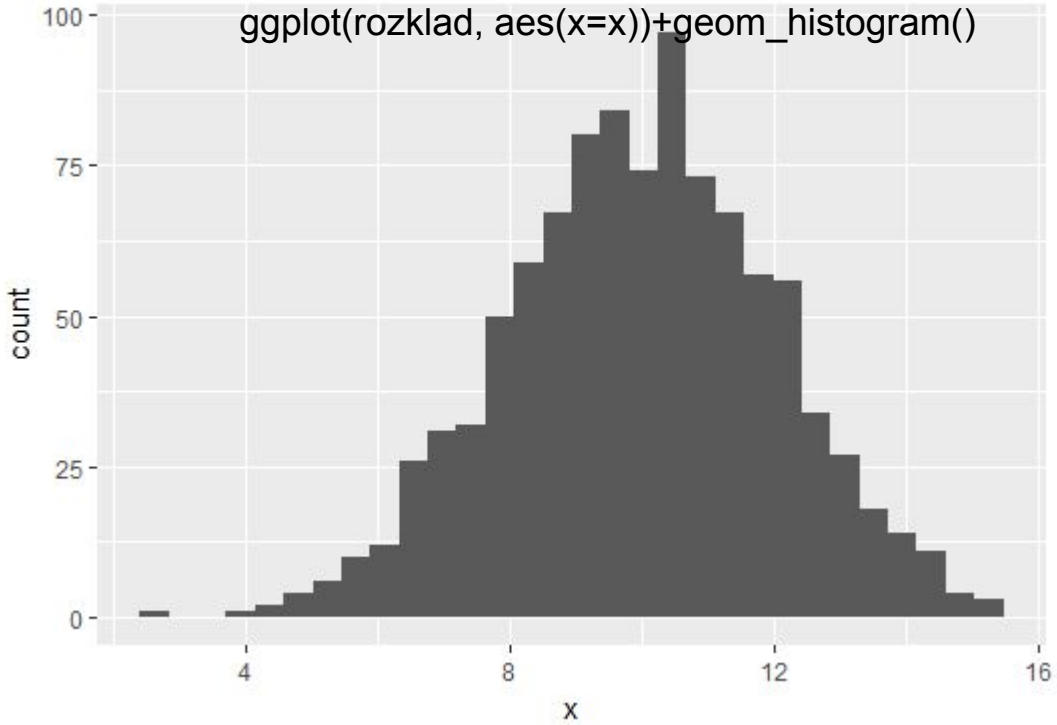
-jest ich wiele

-nie wszystkie trzeba znać

-trzeba wiedzieć po co?

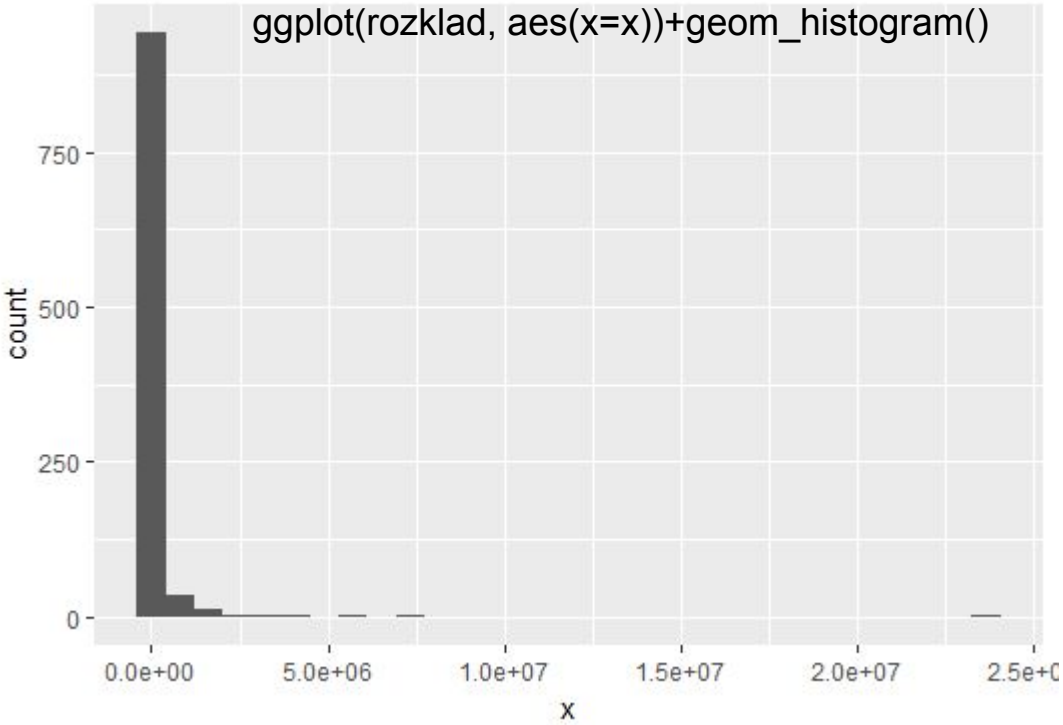
Rozkład normalny

```
rozklad<-data.frame(x=rnorm(1000,10,2))
ggplot(rozklad, aes(x=x))+geom_histogram()
```



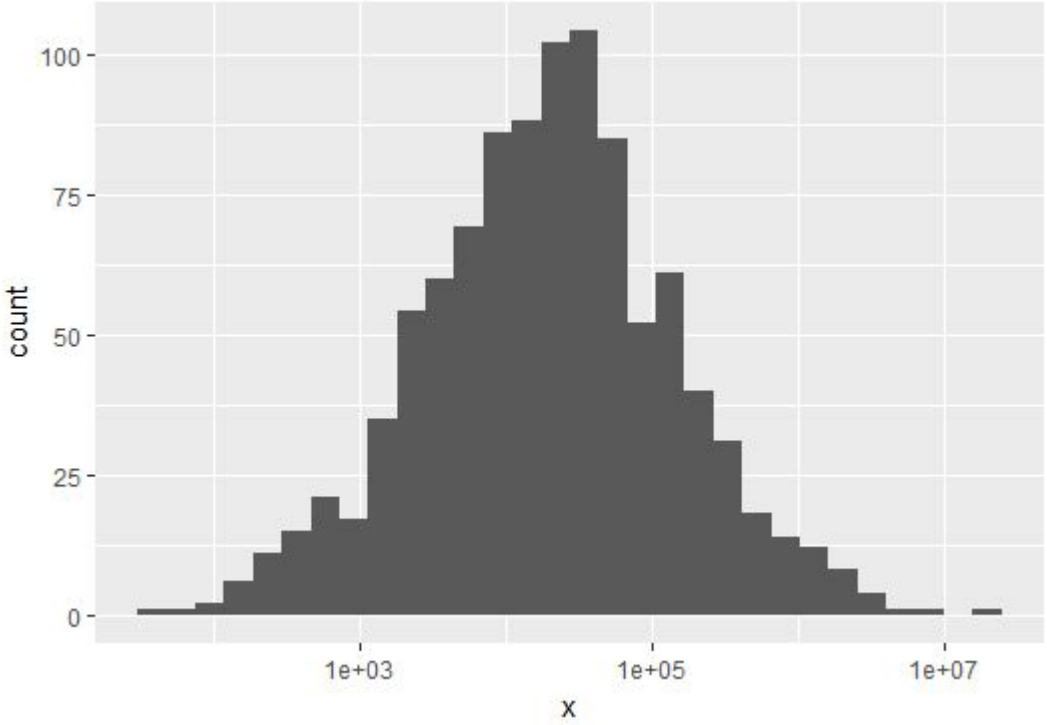
Rozkład log-normalny

```
rozklad<-data.frame(x=rlnorm(1000,10,2))
ggplot(rozklad, aes(x=x))+geom_histogram()
```

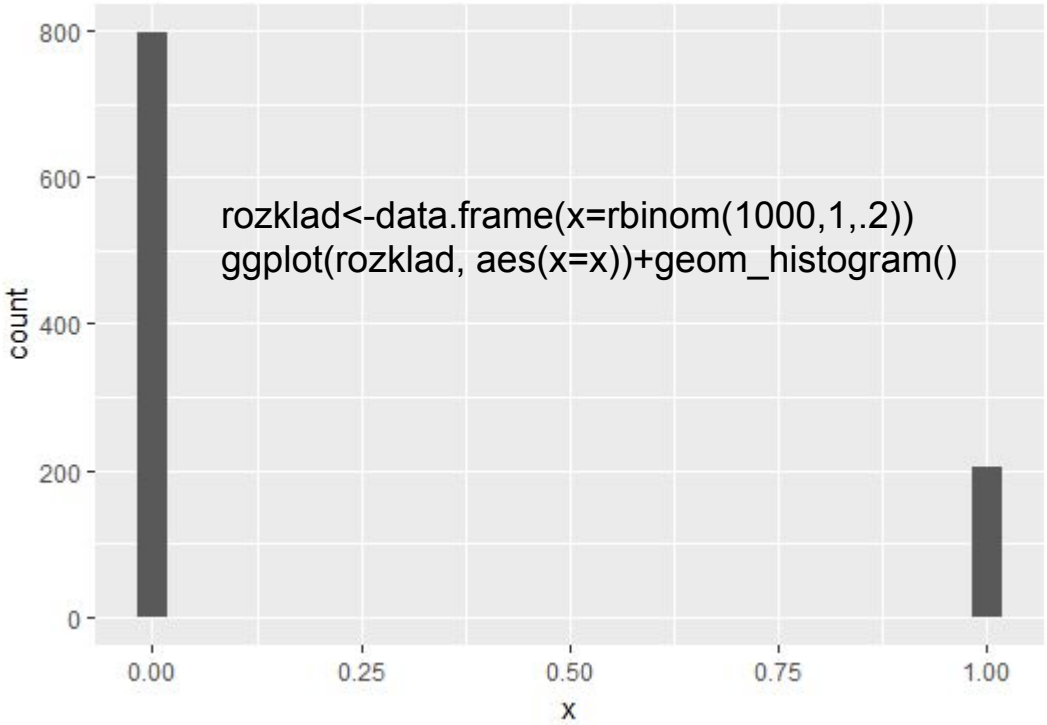


Rozkład log-normalny

```
rozklad<-data.frame(x=rlnorm(1000,10,2))
ggplot(rozklad, aes(x=x))+geom_histogram() +scale_x_log10()
```

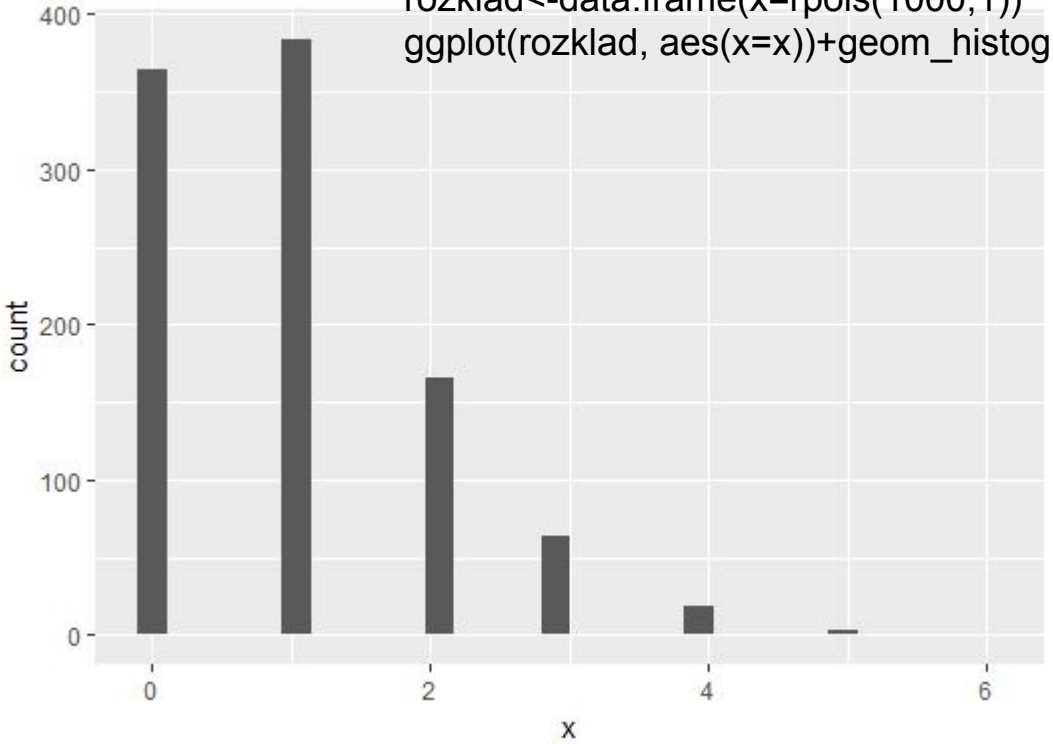


Rozkład dwumianowy



Rozkład Poissona - dyskretny

```
rozklad<-data.frame(x=rpois(1000,1))
ggplot(rozklad, aes(x=x))+geom_histogram()
```



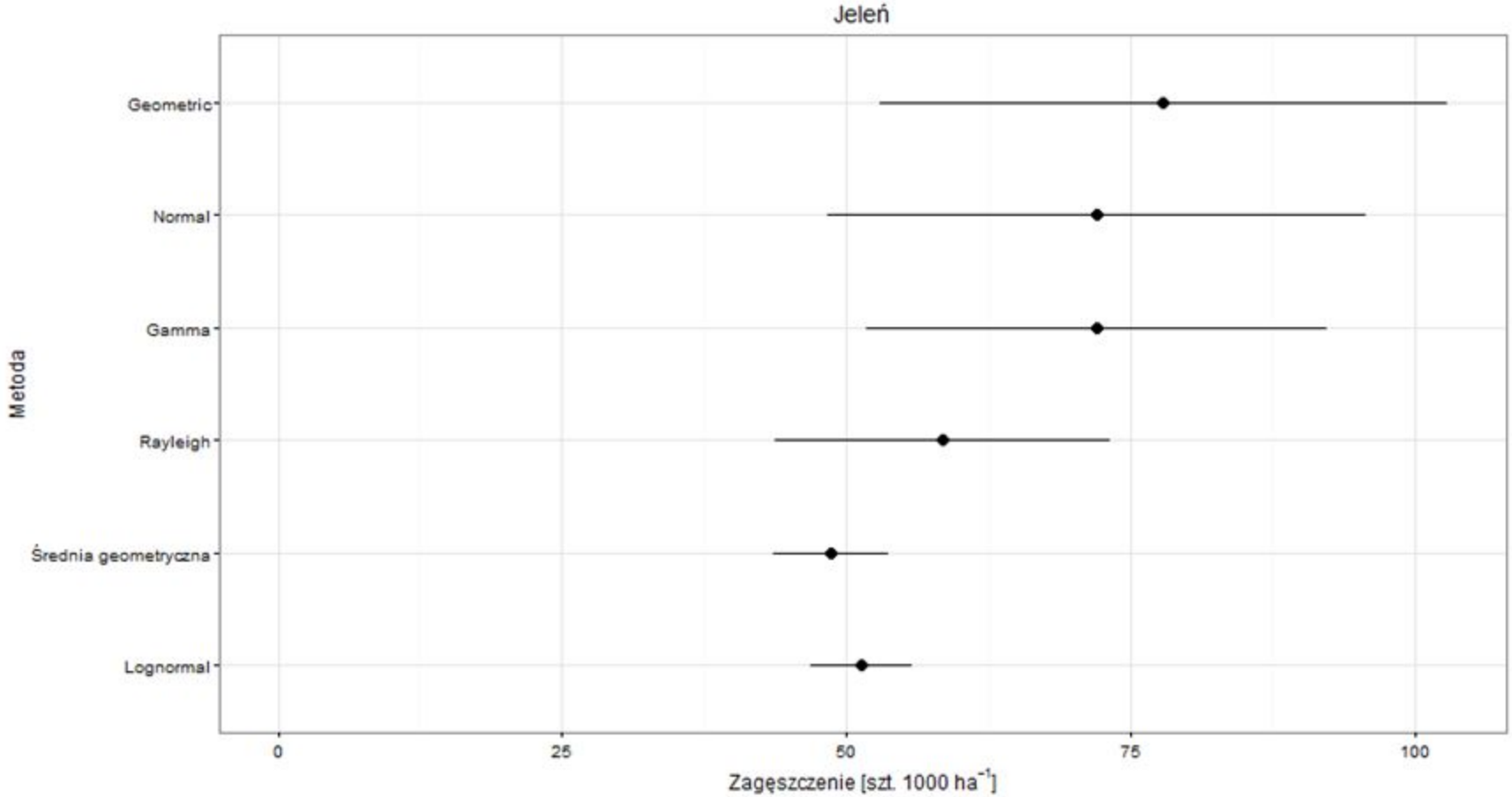
Konsekwencje

dobór rozkładu do modelu liniowego

rozkład błędów - lepsze dopasowanie

inne możliwości interpretacyjne

założenia testów i procedur


Jeleń
Geometric
Normal
Gamma
Rayleigh
Średnia geometryczna
Lognormal
Metoda
0
25
50
75
100
Zagęszczenie [szt. 1000 ha^{-1}]

Zgodność z rozkładem normalnym

można sprawdzić… (Patryk dziś to pokaże;)

dane biologiczne, z terenu, …

nie zawsze rozkład jest normalny, co wtedy?

testy parametryczne i nieparametryczne

moc testów?

Centralne Twierdzenie Graniczne

wraz ze wzrostem liczby prób rozkład zbliża się do rozkładu normalnego

“Im więcej, tym lepiej”... ;)

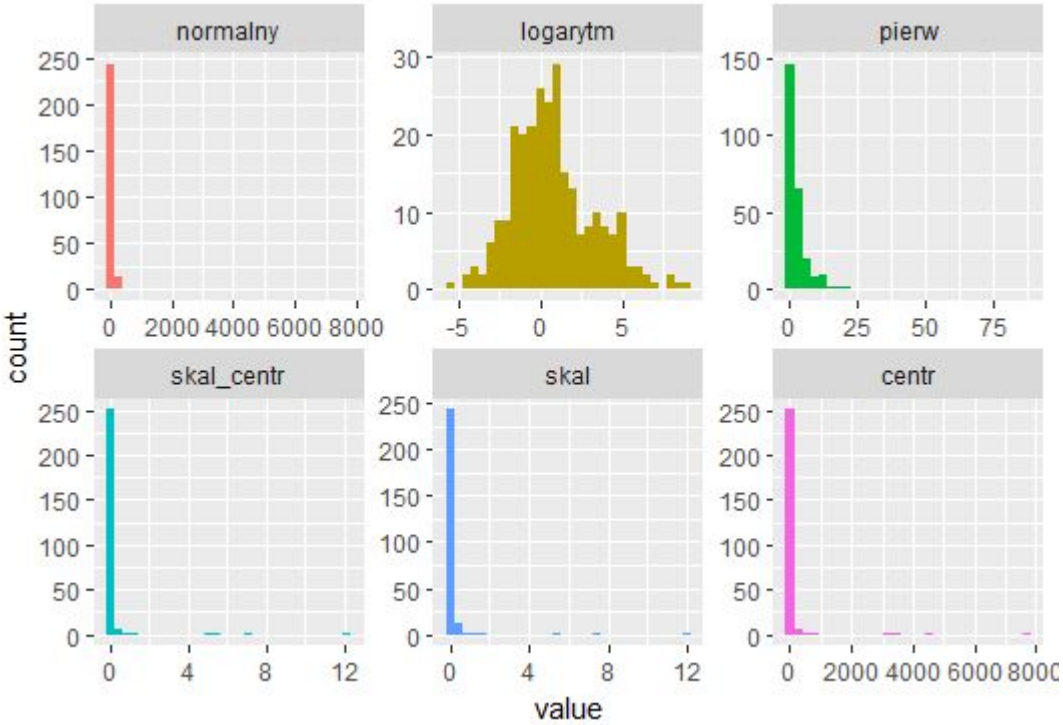
Transformacje

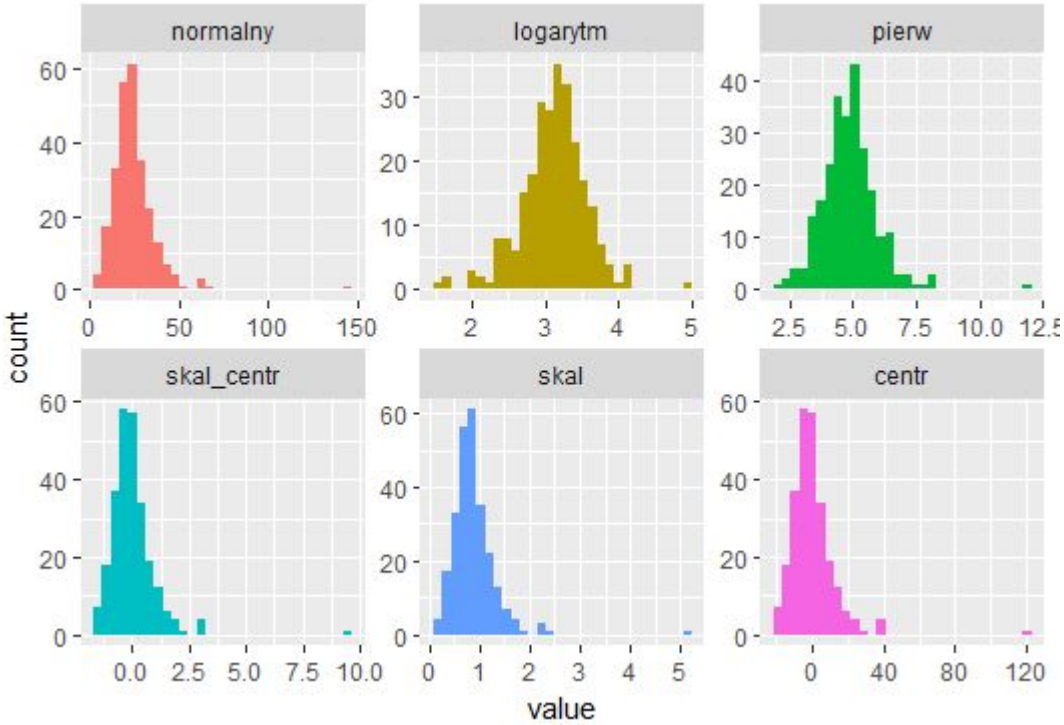
logarytm - log(x)

pierwiastek - sqrt(x)

skalowanie i centrowanie scale(x)

transformacje potęgowe (Box-Cox, Yeo-Johnson)*


normalny
logarytm
pierw
skal_centr
skal
centr
count
value
0
2000
4000
6000
8000
-5
5
25
50
75
4
8
12


normalny
logarytm
pierw
skal_centr
skal
centr
count
value
0
50
100
150
2
3
4
5
2.5
5.0
7.5
10.0
12.5
0.0
1
40
80
120
0
10
20
30
40
60

Czy rozkład sam w sobie coś nam mówi?

częstość zjawiska

skala zjawiska

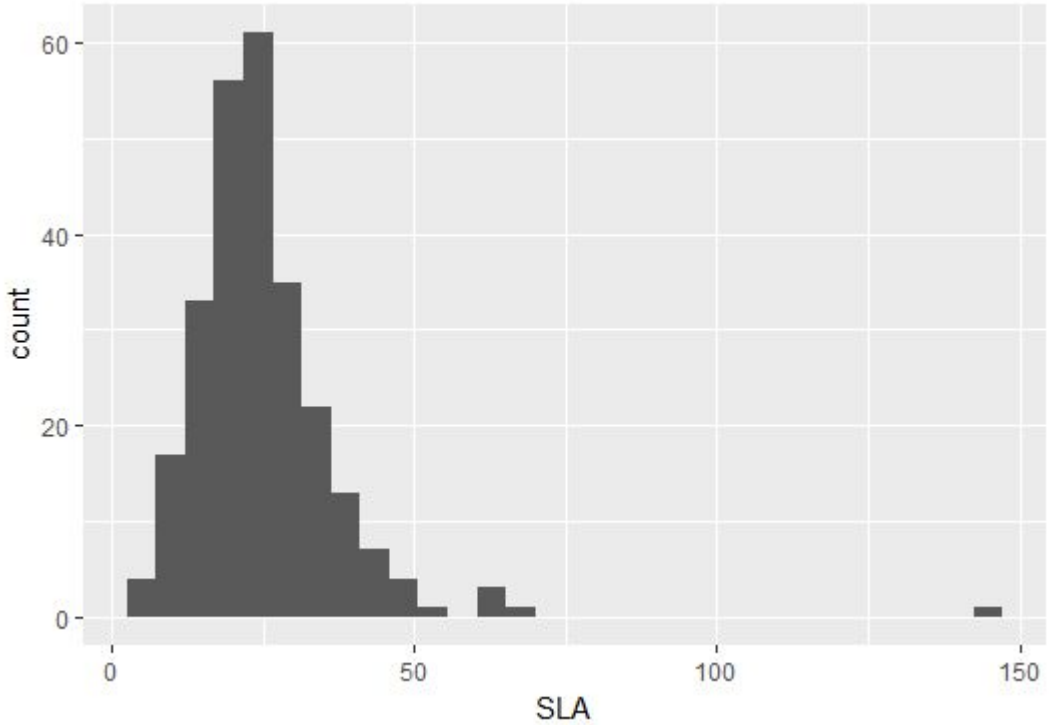
zróżnicowanie

Wizualizacja rozkładów

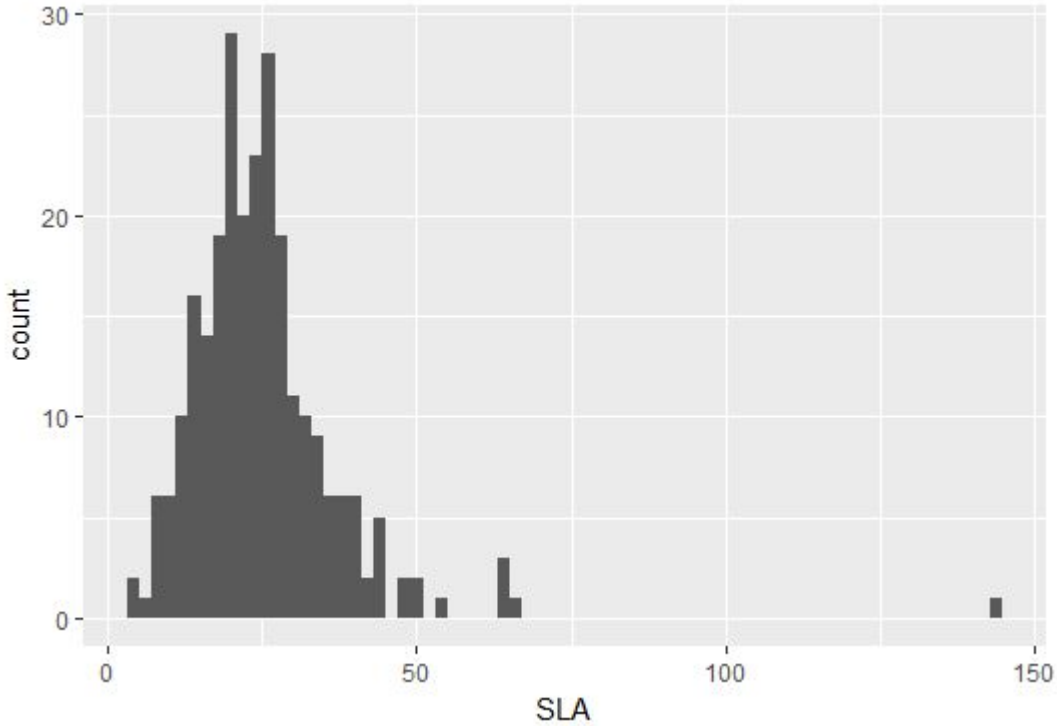
Gęstość prawdopodobieństwa

Prawdopodobieństwo, że losowo wybrany element będzie miał wartość z danego przedziału

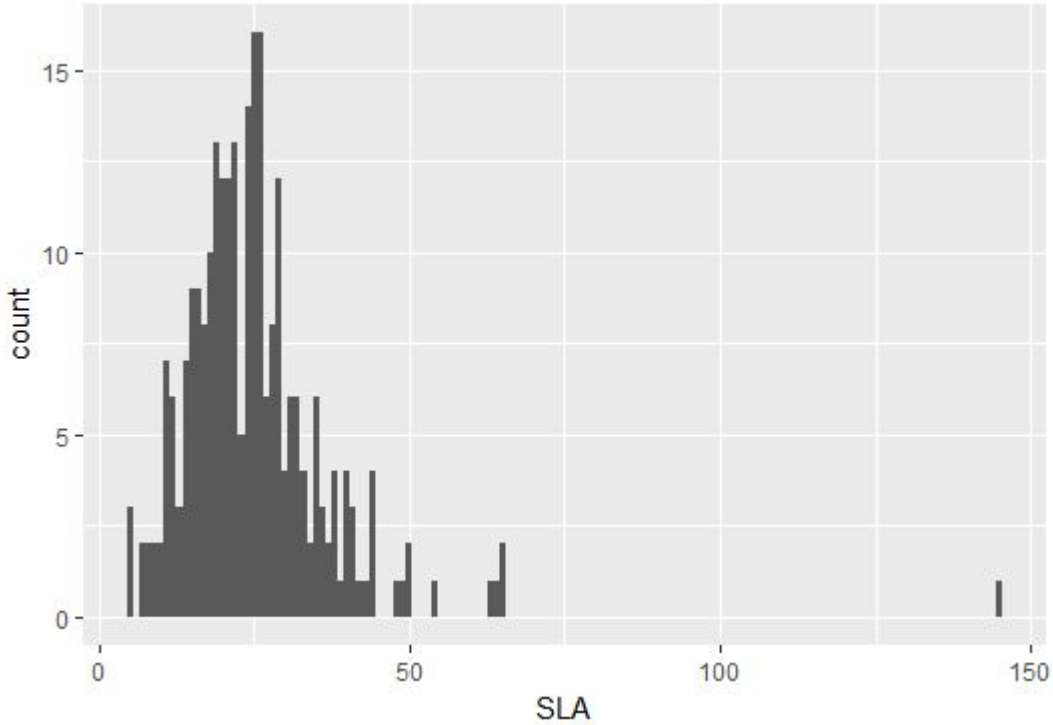
ggplot(eks, aes(x=SLA))+geom_histogram()



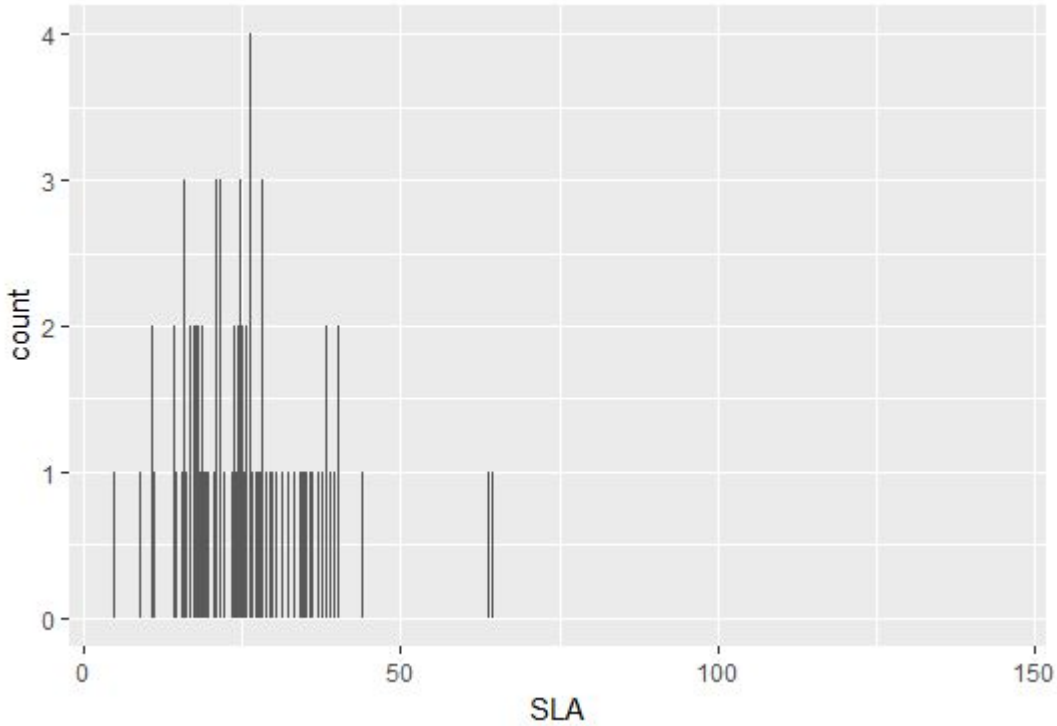
ggplot(eks, aes(x=SLA))+geom_histogram(binwidth=2)



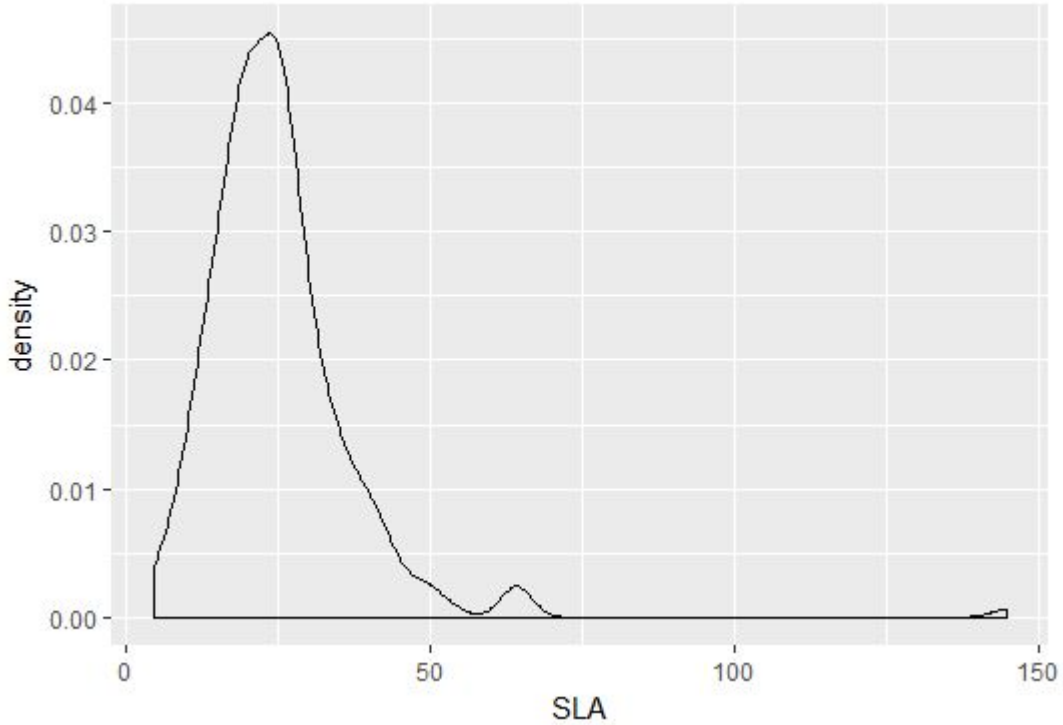
ggplot(eks, aes(x=SLA))+geom_histogram(binwidth=1)



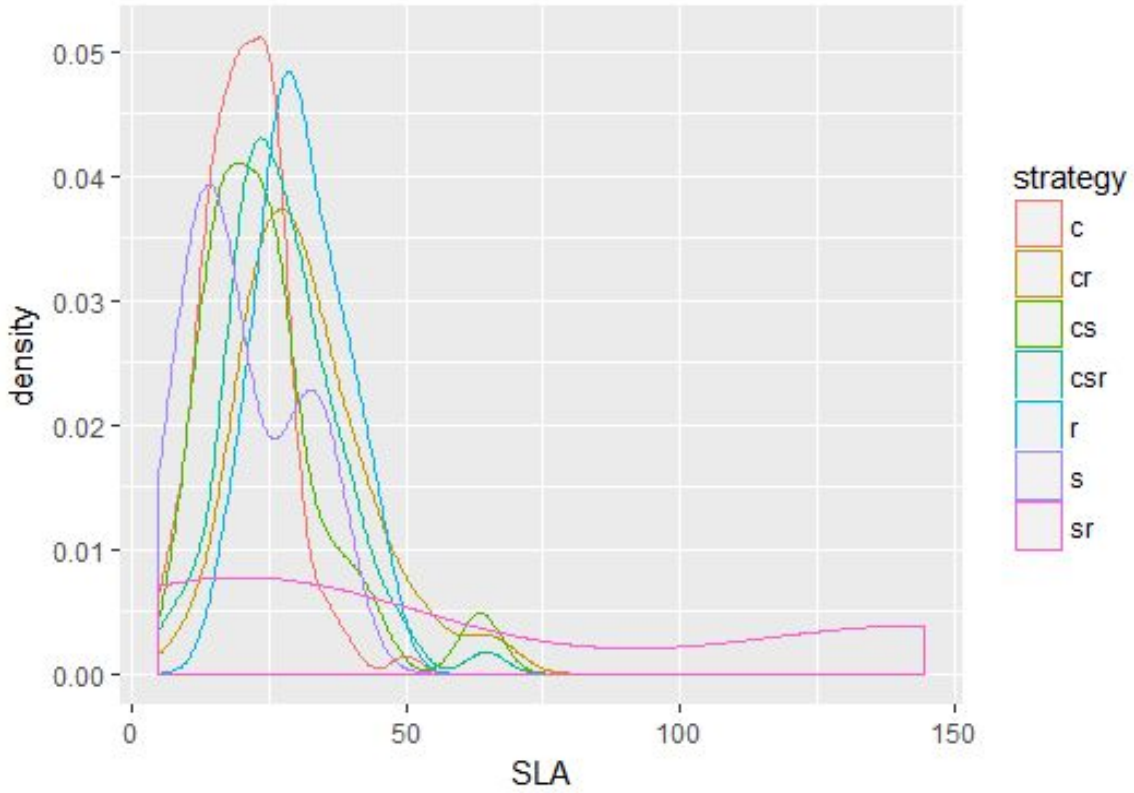
ggplot(eks, aes(x=SLA))+geom_histogram(binwidth=.1)

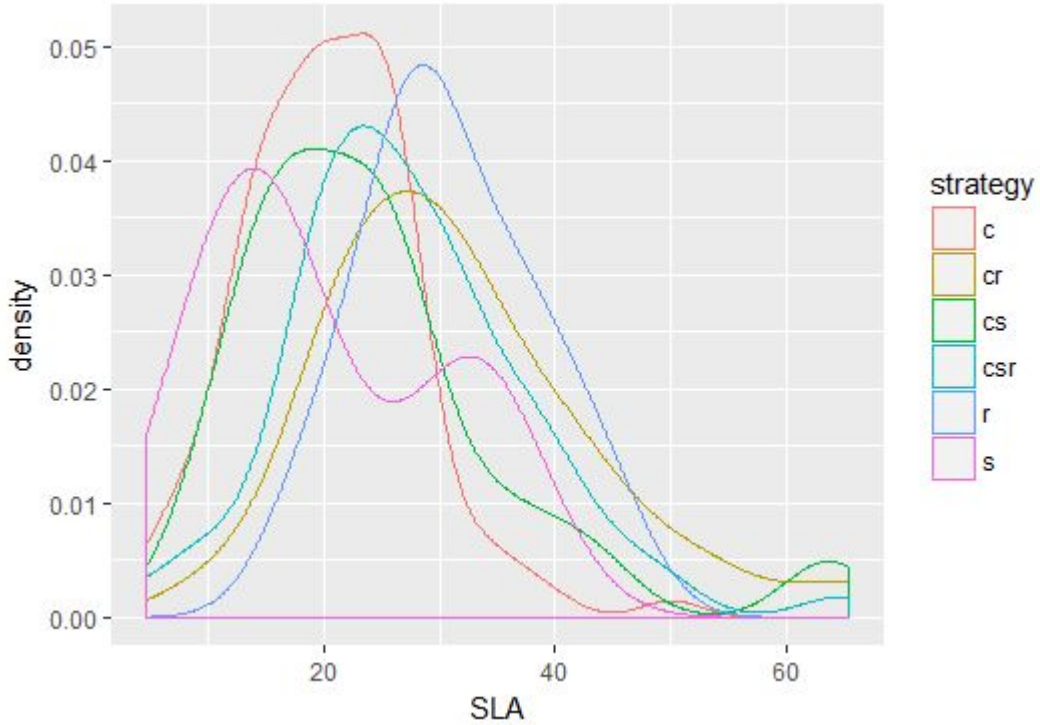


ggplot(eks, aes(x=SLA))+geom_density()



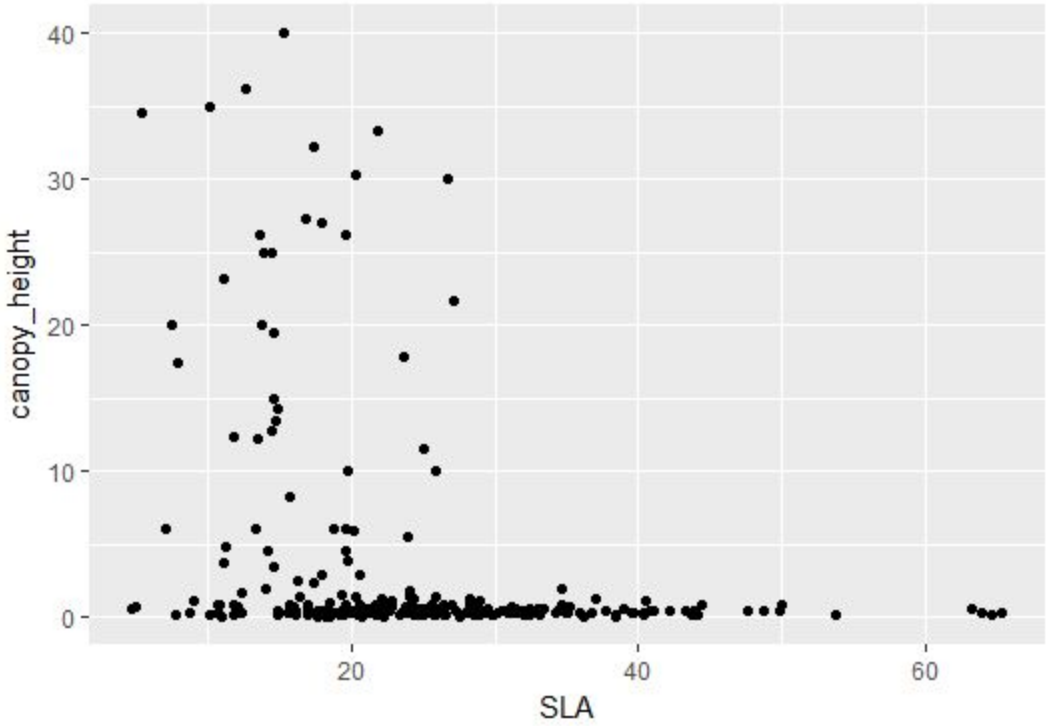
ggplot(subset(eks,!is.na(strategy)), aes(x=SLA,col=strategy))+geom_density()

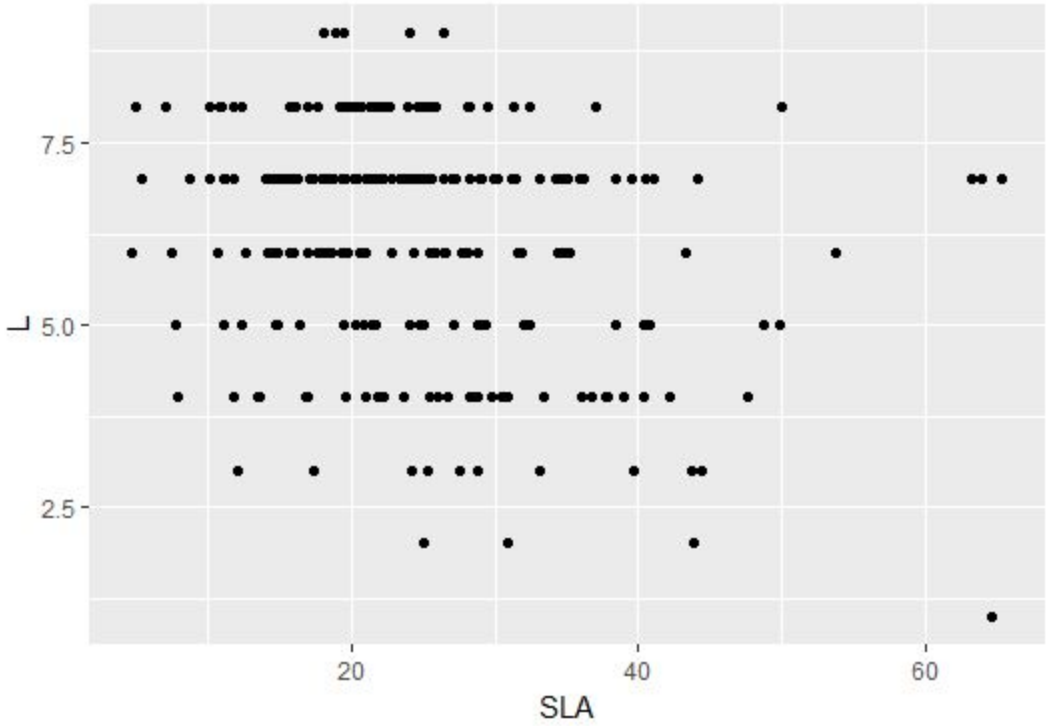



0.05
0.04
0.03
0.02
0.01
0.00
density
20
40
60
SLA
strategy
c
cr
cs
csr
r
s

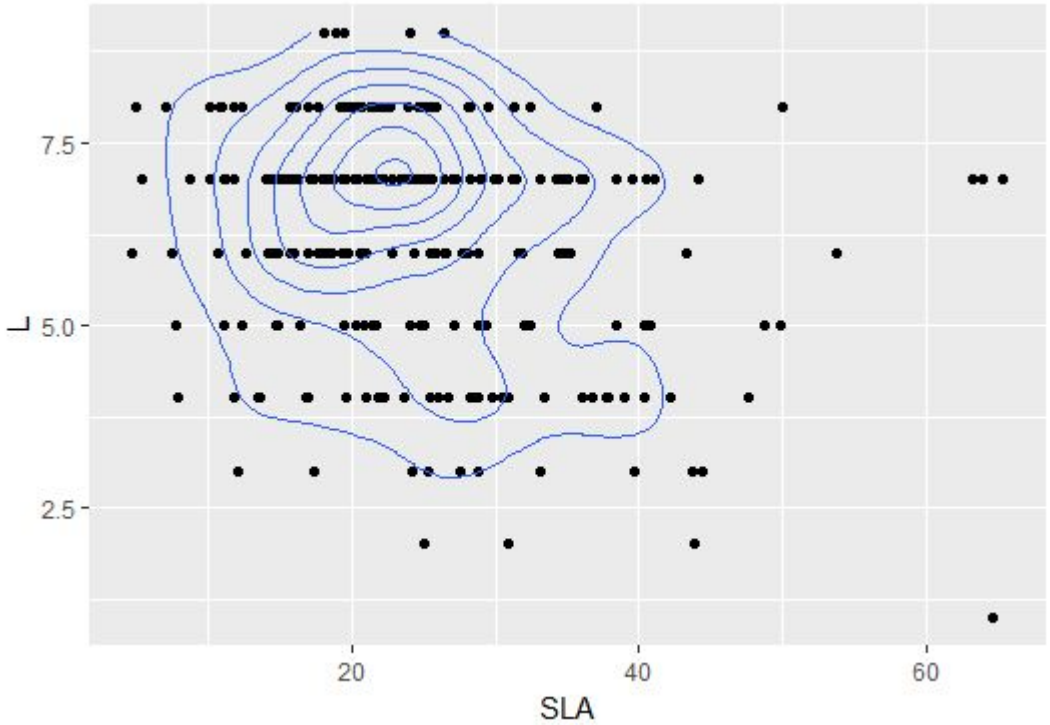
Dwuwymiarowy estymator gęstości

+geom_density_2d()

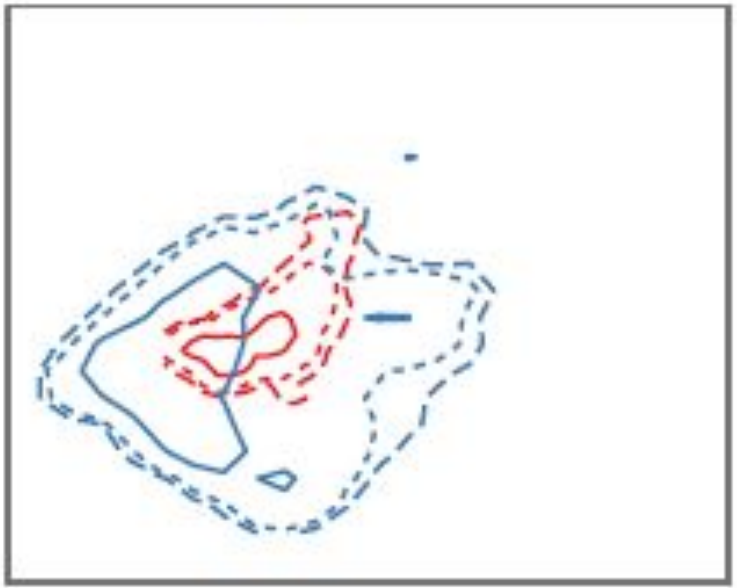

canopy_height
40
30
20
10
0
20
40
60
SLA


7.5
5.0
2.5
20
40
60
SLA

```
ggplot(subset(eks,SLA<100),
aes(x=SLA,y=L))+geom_point()+geom_density_2d()
```



Solidago canadensis



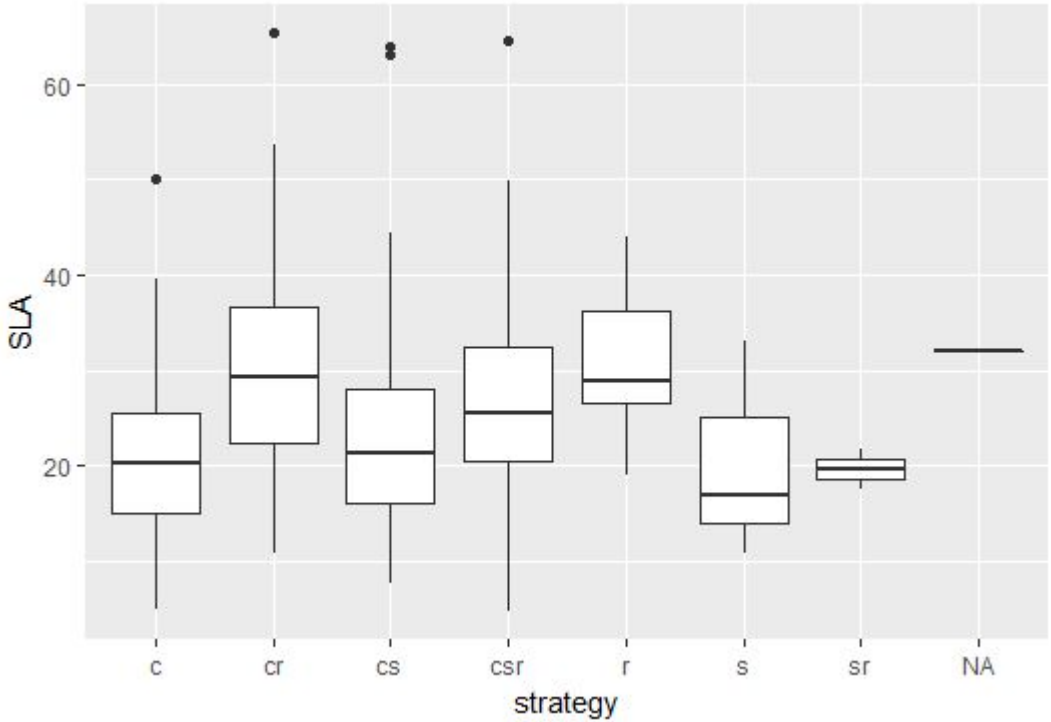
fraction

0.5

0.9

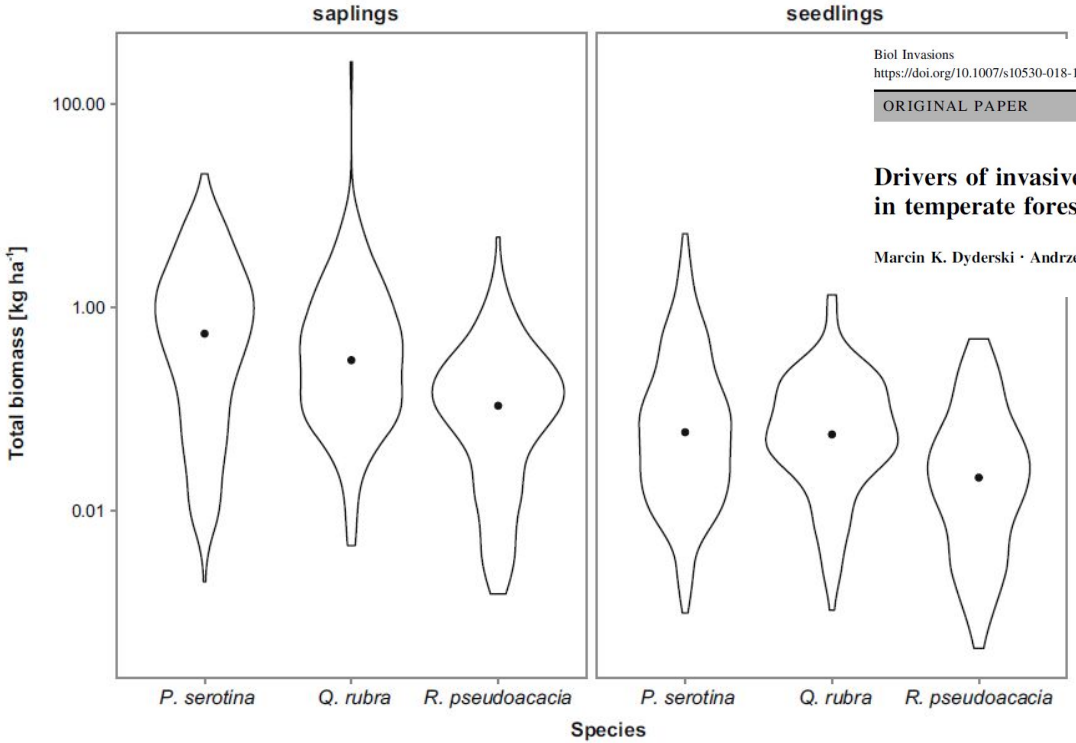
0.95

Boxploty



ggplot(subset(eks,SLA<100), aes(x=strategy,y=SLA))+geom_boxplot()

Violinploty



Biol Invasions
https://doi.org/10.1007/s10530-018-1706-3

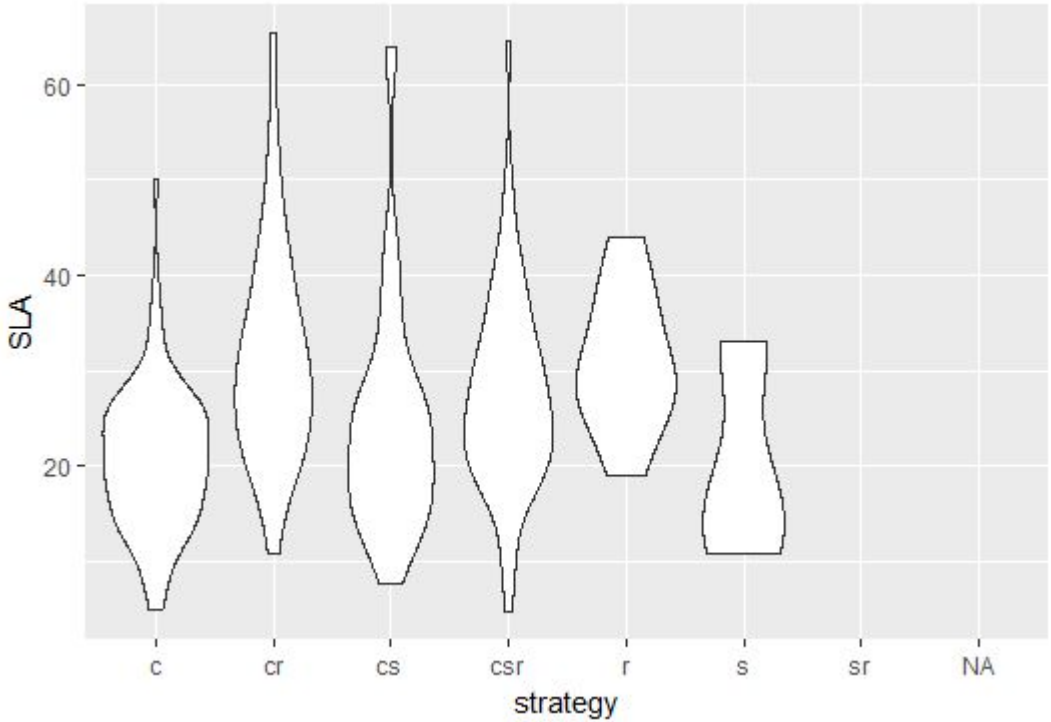
CrossMark

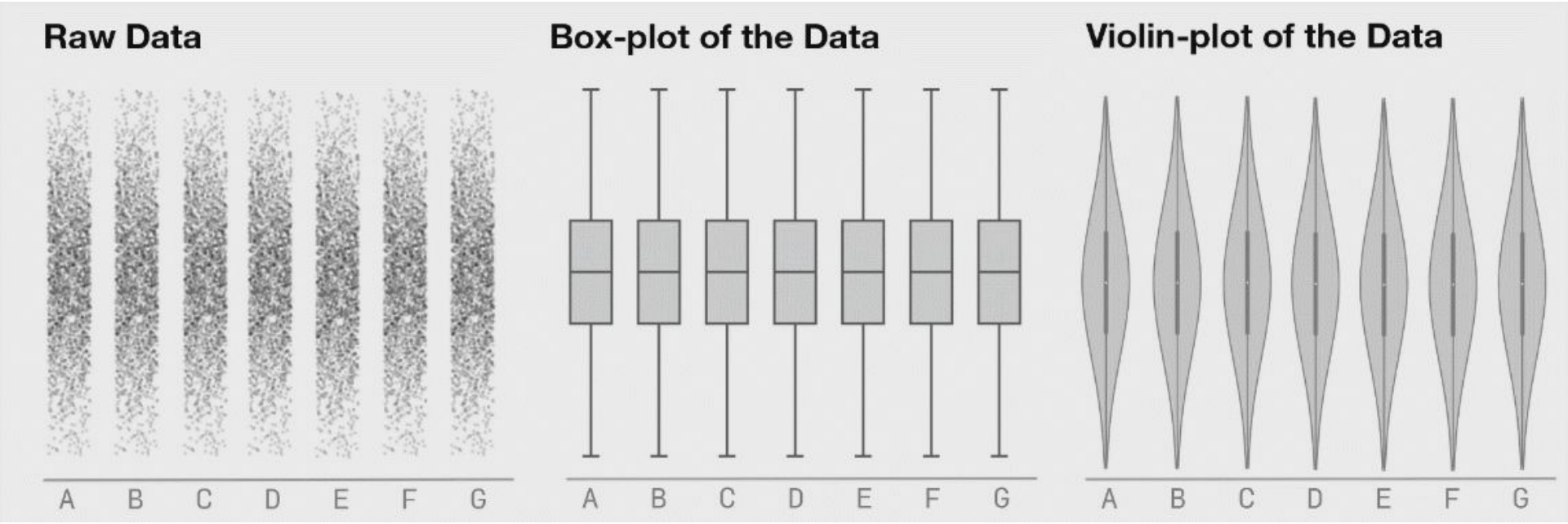
ORIGINAL PAPER

Drivers of invasive tree and shrub natural regeneration in temperate forests

Marcin K. Dyderski · Andrzej M. Jagodziński

ggplot(subset(eks,SLA<100), aes(x=strategy,y=SLA))+geom_violin()





https://www.autodeskresearch.com/publications/samestats

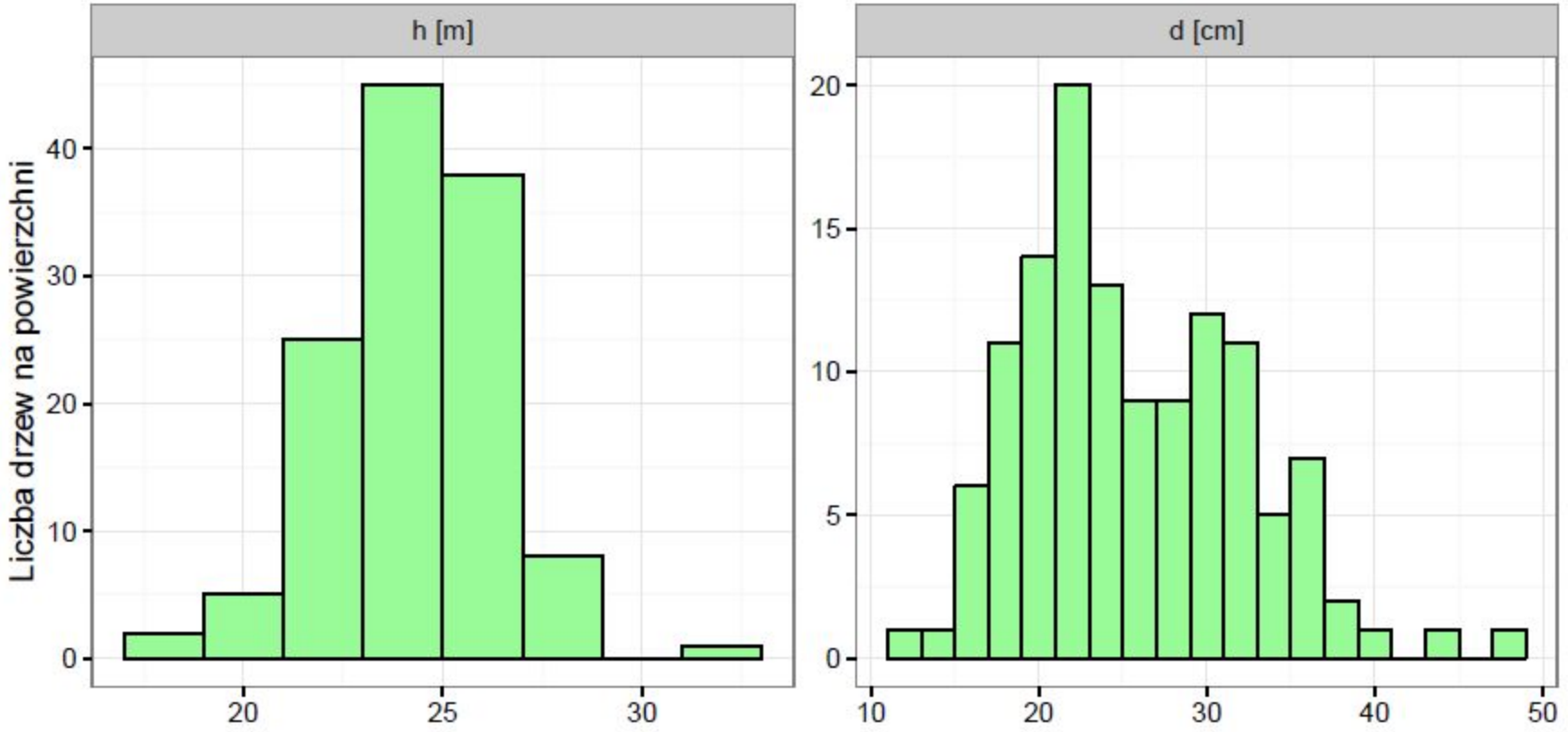
Zawsze patrz na dane!

obrazki są podstawą pracy w analizie danych

nawet jak umiesz interpretować cyfry, łatwiej jest dojrzeć historię stojącą za danymi…

nawet jak trzeba zastosować mało standardowe sposoby prezentacji danych...

Struktura grubościowa i wysokościowa gatunku głównego:



Historia pewnych badań

DOI: 10.1515/frp-2017-0032
Wersja PDF: www.lesne-prace-badawcze.pl

Leśne Prace Badawcze / *Forest Research Papers*
Grudzień / December 2017, Vol. 78 (4): 285–296

ORYGINALNA PRACA NAUKOWA

e-ISSN 2082-8926

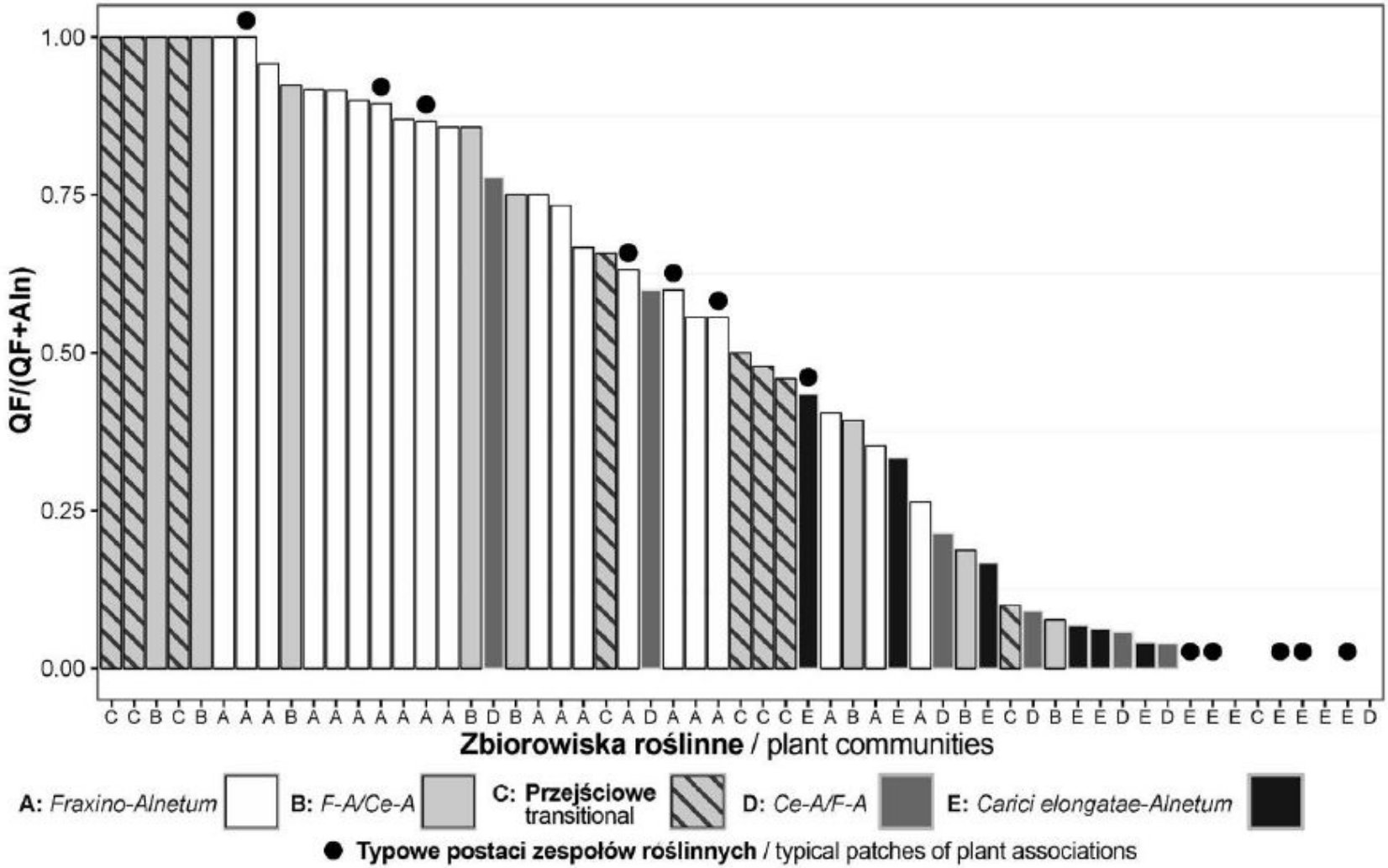
Ciągłość kompozycji florystycznej pomiędzy dwoma zbiorowiskami roślinnymi – *Carici elongatae-Alnetum* oraz *Fraxino-Alnetum*

Continuum of floristic composition between two plant communities – *Carici elongatae-Alnetum* and *Fraxino-Alnetum*

Natalia Czapiewska[1], Sonia Paź[1], Marcin K. Dyderski[2,3], Andrzej M. Jagodziński[2,3]*

[1]Uniwersytet Przyrodniczy w Poznaniu, Wydział Leśny, ul. Wojska Polskiego 28, 60-637 Poznań; [2]Instytut Dendrologii Polskiej Akademii Nauk, Pracownia Ekologii, ul. Parkowa 5, 62-035 Kórnik; [3]Uniwersytet Przyrodniczy w Poznaniu, Wydział Leśny, Katedra Łowiectwa i Ochrony Lasu, ul. Wojska Polskiego 71C, 60-625 Poznań

*Tel. 48 61 8170033; e-mail: amj@man.poznan.pl


1.00
0.75
0.50
0.25
0.00
QF/(QF+Aln)
C C B C B A A A B A A A A A A A B D B A A A C A D A A A C C C E A B A E A D B E C D B E E D E D E E E C E E E E D
Zbiorowiska roślinne / plant communities
A: Fraxino-Alnetum
B: F-A/Ce-A
C: Przejściowe transitional
D: Ce-A/F-A
E: Carici elongatae-Alnetum
Typowe postaci zespołów roślinnych / typical patches of plant associations

Historia innych badań

Climate change, tourism and historical grazing influence the distribution of *Carex lachenalii* Schkuhr – A rare arctic-alpine species in the Tatra Mts

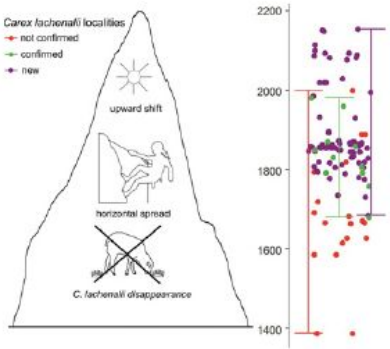
Patryk Czortek [a,*], Anna Delimat [b], Marcin K. Dyderski [c,d], Antoni Zięba [e], Andrzej M. Jagodziński [c,d], Bogdan Jaroszewicz [a]

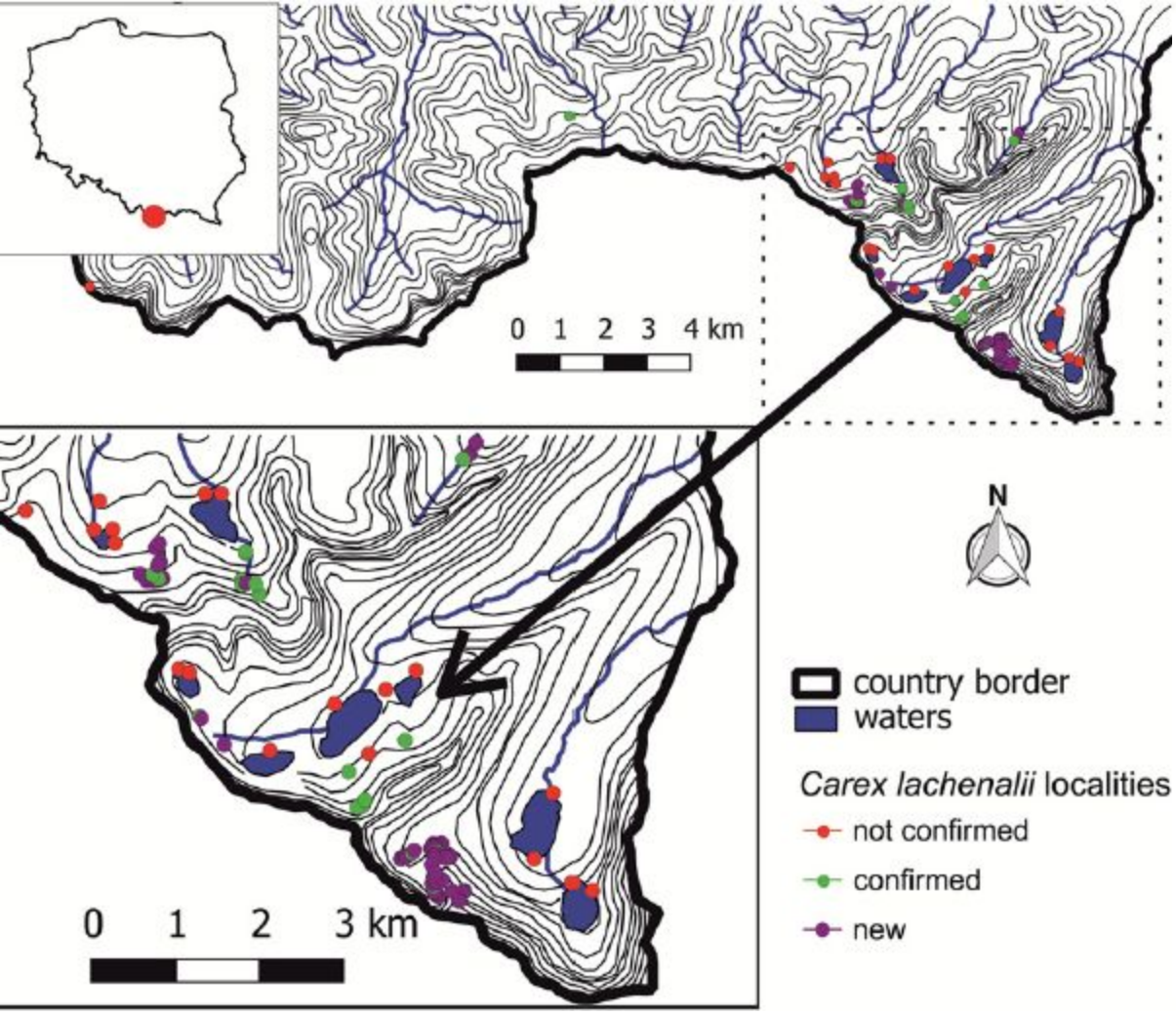
[a] Białowieża Geobotanical Station, Faculty of Biology, University of Warsaw, Sportowa 19, 17-230 Białowieża, Poland
[b] W. Szafer Institute of Botany, Polish Academy of Sciences, Lubicz 46, 31-512 Kraków, Poland
[c] Institute of Dendrology, Polish Academy of Sciences, Parkowa 5, 62-035 Kórnik, Poland
[d] Department of Game Management and Forest Protection, Faculty of Forestry, Poznań University of Life Sciences, Wojska Polskiego 71c, 60-625 Poznań, Poland
[e] Tatra National Park, Kuźnice 1, 34-500 Zakopane, Poland

HIGHLIGHTS

- We assessed niche shift of a model arctic-alpine species.
- Vegetation pattern shows competition – mediated retreat from lower elevations.
- Climate warming allowed colonization of higher elevations, lacking in competitors.
- Modern habitat changes both threats and promotes rare mountain plant species.

GRAPHICAL ABSTRACT





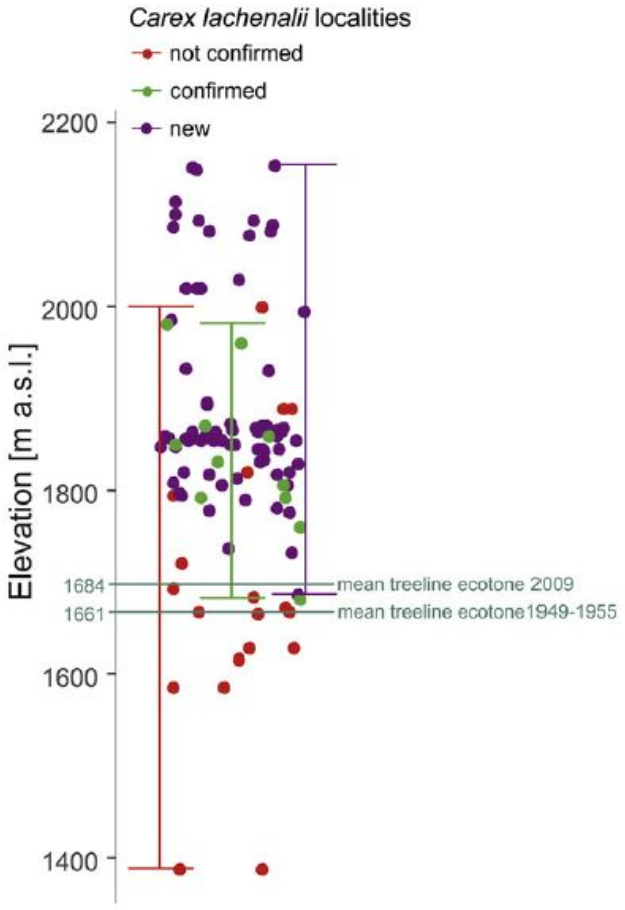
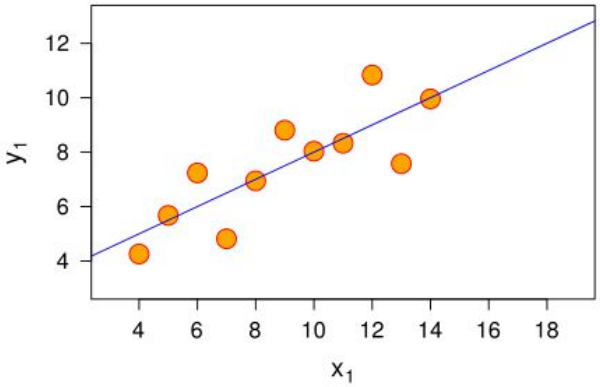
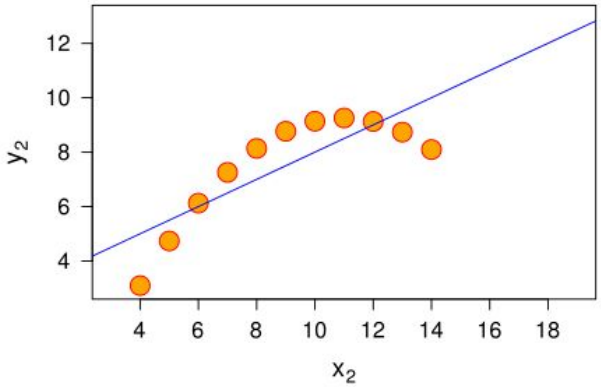


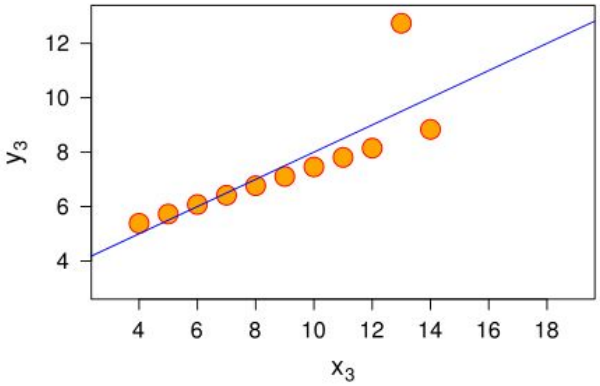
Fig. 2. Elevational upward shift of *Carex lachenalii* after 50–150 years.

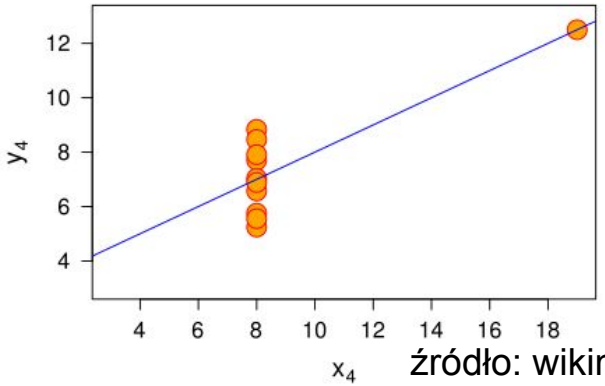
Kwadrat Ascombe’a

średnia y=7,5 średnia x=9
współczynnik r2=0,816
równanie regresji:
y=3+0,5*x









źródło: wikimedia.org

Dzielenie na klasy/przedziały

cut()

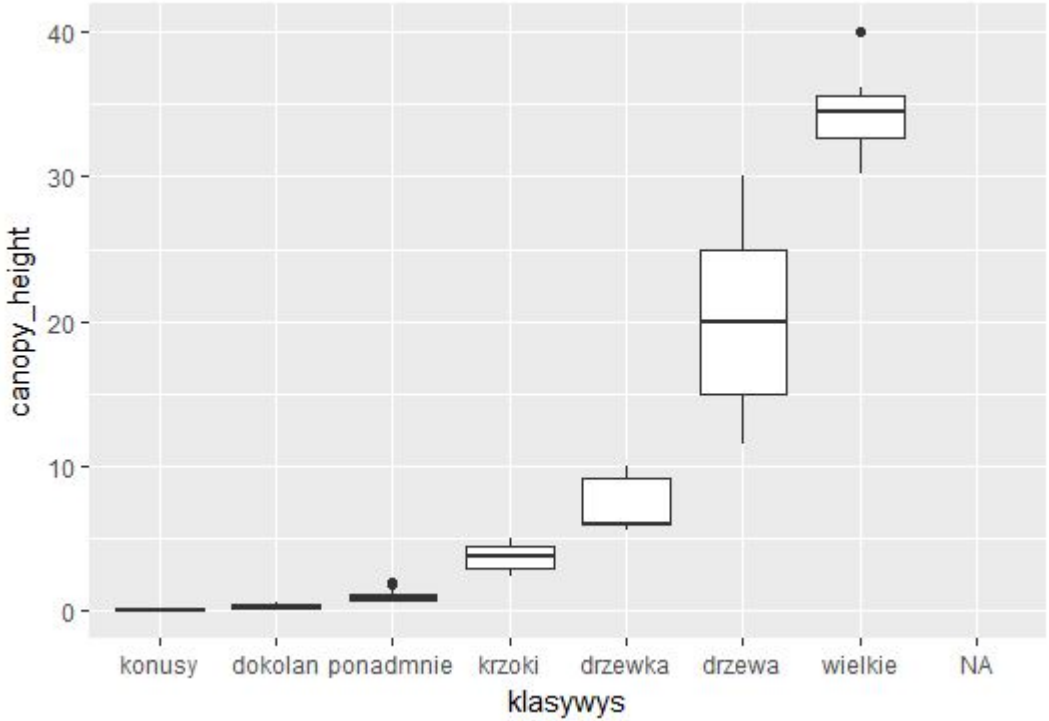
cut(zmienna, breaks, labels)

eks$klasywys<-cut(eks$canopy_height,breaks=c(0,.1,.5,2,5,10,30,50),labels=c('konusy','dokolan','ponadmnie','krzoki','drzewka','drzewa','wielkie'))

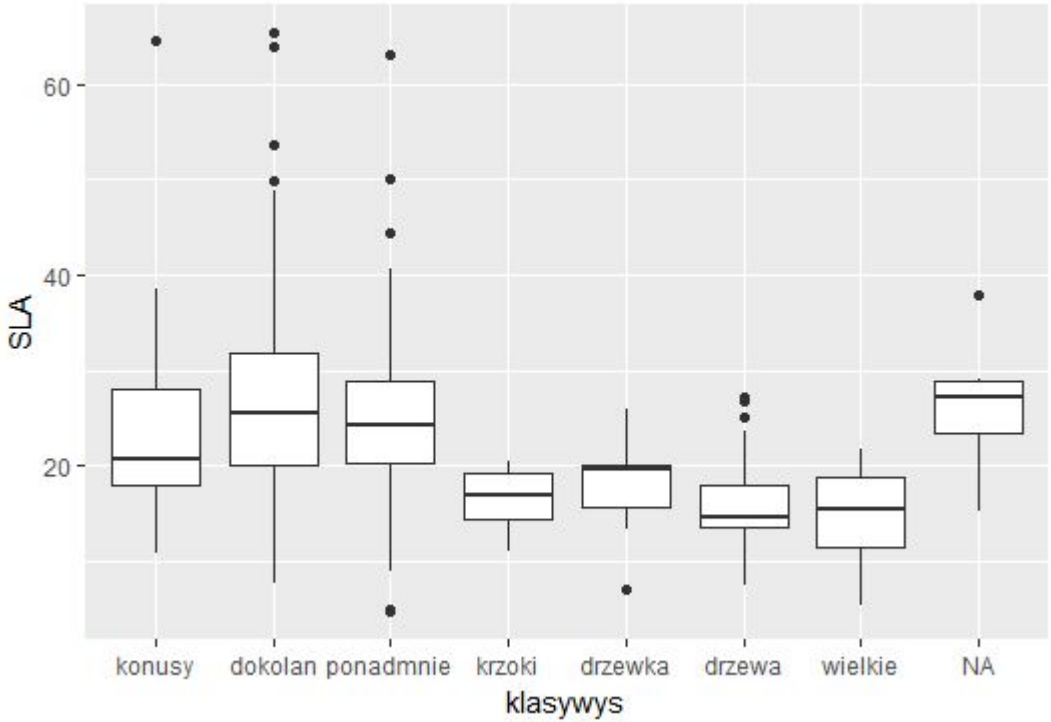
nowa zmienna

breaks musi się zaczynać czymś mniejszym niż min(zmienna) i kończyć większym niż max(zmienna)

ggplot(eks, aes(x=klasywys,y=canopy_height))+geom_boxplot()



ggplot(subset(eks,SLA<100), aes(x=klasywys,y=SLA))+geom_boxplot()



Łączenie grup

```
> table(eks$class)

         0        aln     art vul       aspl        bid
        60          4          50          1          4
   cal uli        epi     fes bro    koe cor    mol arr
        11          4          15         11         36
   mon car        phr     pol poe    que fag que rob-pet
         1          3           1         50         12
   rha pru        sal     sch car    ste med    tri ger
        12          1           2         13          9
   vac pic
        12
>
```

dwuwymiarowe tablice kontyngencji

```
> table(eks$class,eks$stare.lasy)

                0  1
  0            53  7
  aln           4  0
  art vul      46  4
  aspl          1  0
  bid           4  0
  cal uli      10  1
  epi           4  0
  fes bro      15  0
  koe cor      11  0
  mol arr      36  0
  mon car       1  0
  phr           3  0
  pol poe       1  0
  que fag      19 31
  que rob-pet  11  1
  rha pru      12  0
  sal           1  0
  sch car       2  0
  ste med      13  0
  tri ger       8  1
  vac pic       8  4
>
```

łączenie grup

mam 21 length(unique(eks$class)) grup

chcę mieć mniej:

-zmiana ręczna w excelu (dla lamusów)

-plyr::mapvalues(zmienna, from, to)

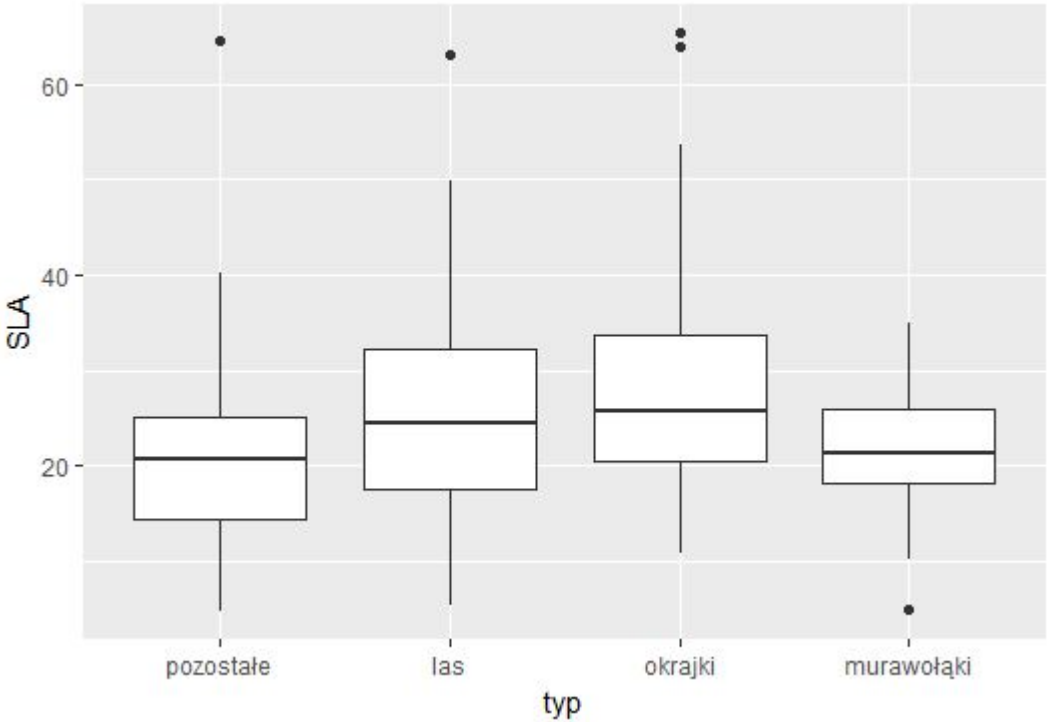
```
eks$typ<-plyr::mapvalues(eks$class,

unique(eks$class),

c('las','pozostałe','murawołąki','okrajki','okrajki','murawołąki','murawołąki','las','murawołąki','las','las','okrajki','okrajki','okrajki','murawołąki','okrajki','pozostałe','murawołąki','pozostałe','las','pozostałe'))
```

wpisane z ręki, odpowiada kolejności w unique(eks$class)

ggplot(subset(eks,SLA<100), aes(x=typ,y=SLA))+geom_boxplot()



Obróbka danych

dplyr - pakiet kluczowy

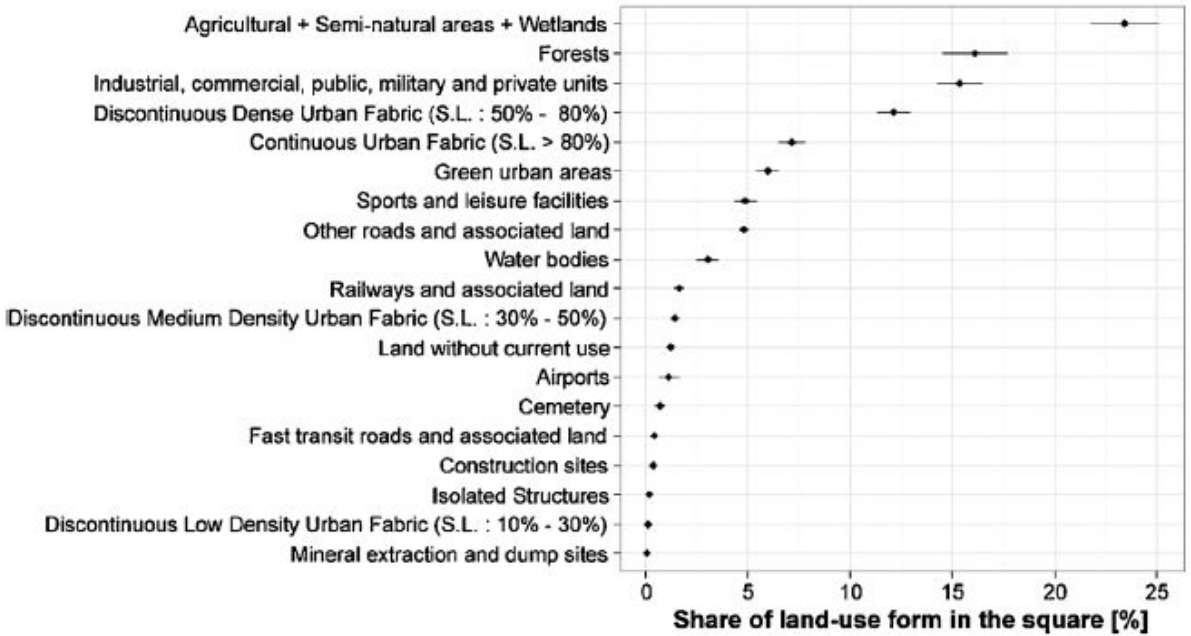
składnia

data.frame%>%select(zmienne)%>%filter(x>10,y<20,co==’to’)%>%

group_by(grupa)%>%summarise(srednia=mean(x),sd=sd(y),suma=sum(z))

jak doprowadzić dane do takiej formy?

M.K. Dyderski et al.



232 kwadraty

dla kwadratu - udział typów powierzchni

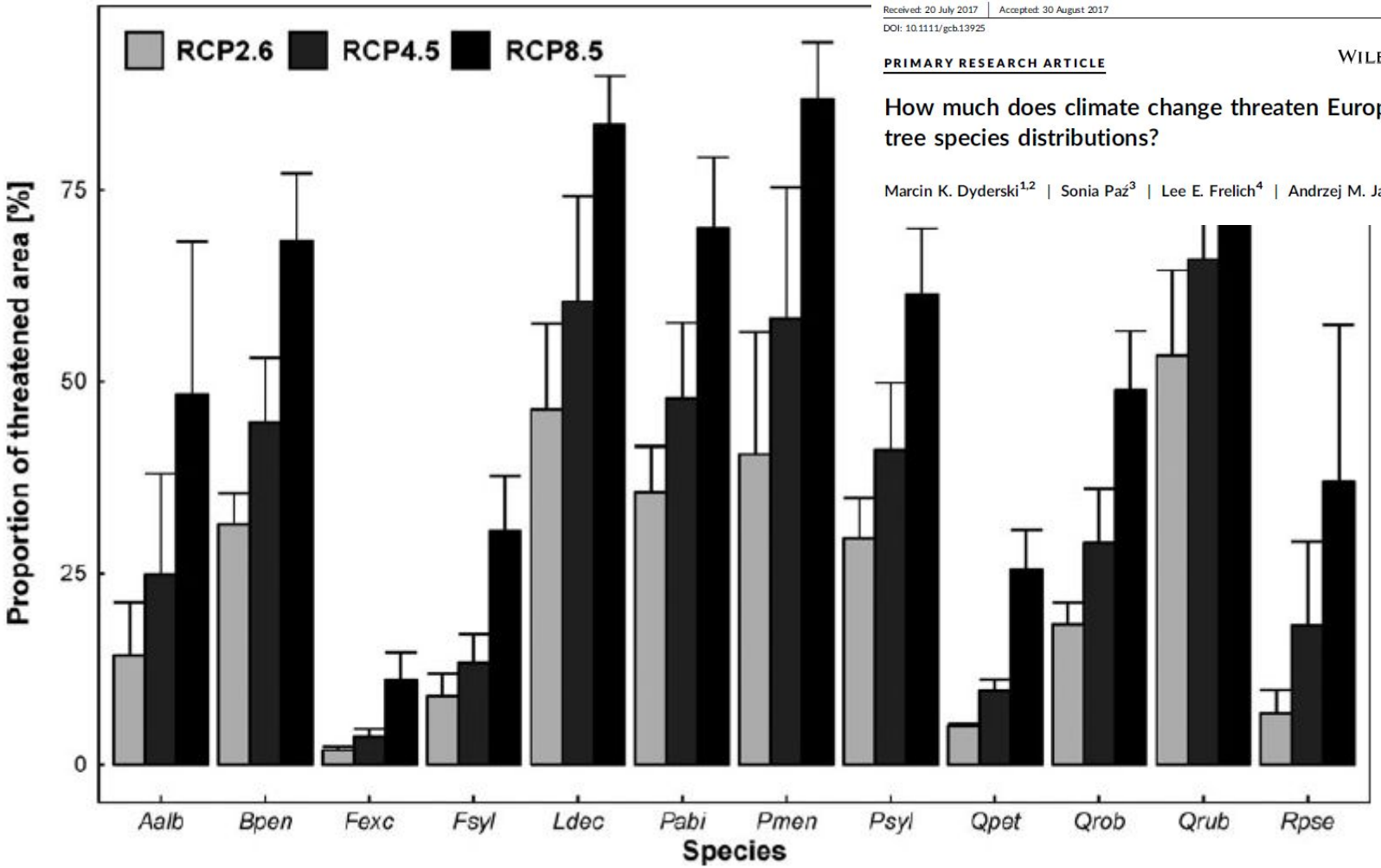
split - apply - combine

split - na typy powierzchni group_by()

apply - uśrednienie summarise()

combine - zwraca nam uśrednione wyniki

```
dane%>%group_by(typ)%>%summarise(srednia=mean(udzial),se=se(udzial))
```



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DOI: 10.1111/gcb.13925

PRIMARY RESEARCH ARTICLE

WILEY Global Change Biology

How much does climate change threaten European forest tree species distributions?

Marcin K. Dyderski[1,2] | Sonia Paź[3] | Lee E. Frelich[4] | Andrzej M. Jagodziński[1,2]

SE a SD

SE=SD/sqrt(n)

se<-function(x) sd(x)/sqrt(length(x))

se<-function(x) sd(x,na.rm=T)/sqrt(length(x[!is.na(x)]))

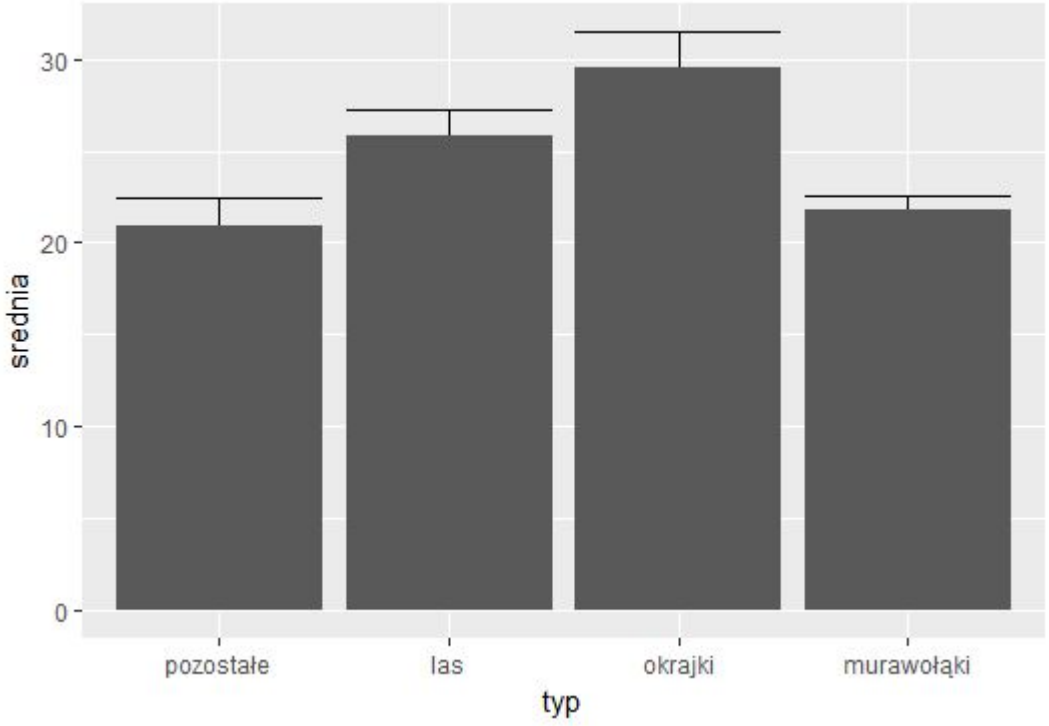
dane%>%group_by(scenariusz, gatunek)%>%summarise(mean=mean(val), se=se(val))

```
eks%>%filter(!is.na(SLA))%>%group_by(typ)%>%summarise(srednia=mean(SLA)
)

# A tibble: 4 x 2
          typ  srednia
       <fctr>    <dbl>
1  pozostałe 20.91537
2         las 25.80841
3    okrajki 29.56142
4 murawołąki 21.83004
```

```
eks%>%filter(!is.na(SLA))%>%group_by(typ)%>%summarise(srednia=mean(SLA)
,se=se(SLA))
# A tibble: 4 x 3
          typ  srednia        se
       <fctr>    <dbl>     <dbl>
1  pozostałe 20.91537 1.5595037
2         las 25.80841 1.4097452
3    okrajki 29.56142 1.9128191
4 murawołąki 21.83004 0.7576967
```

```
df<-eks%>%filter(!is.na(SLA))%>%group_by(typ)%>%summarise(srednia=mean(SLA)
,se=se(SLA))
ggplot(df, aes(x=typ,y=srednia)) +
geom_errorbar(aes(ymin=srednia-se,ymax=srednia+se)) + geom_col()
```



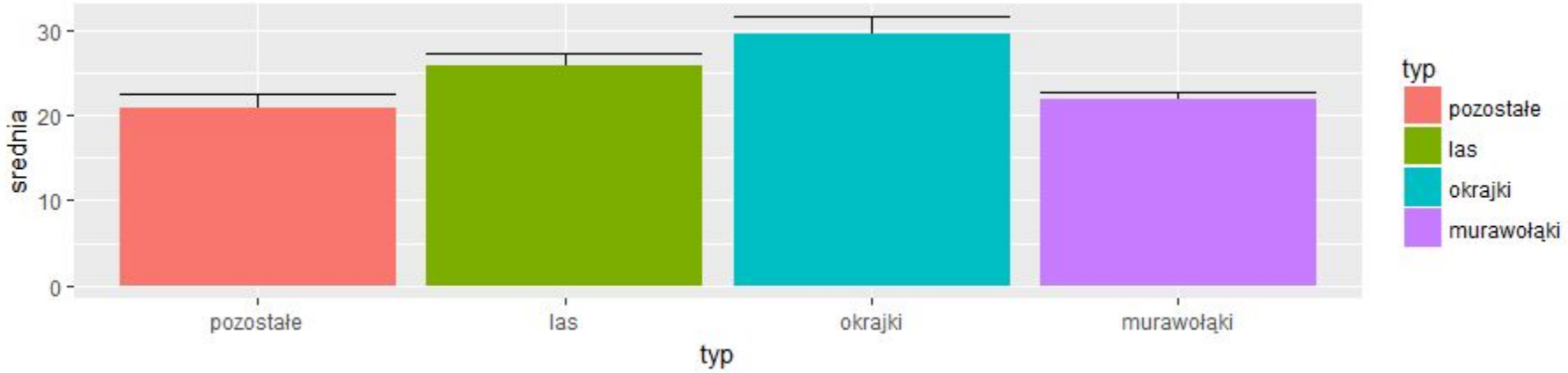
trochę szaro...

fill = kolor wypełnienia

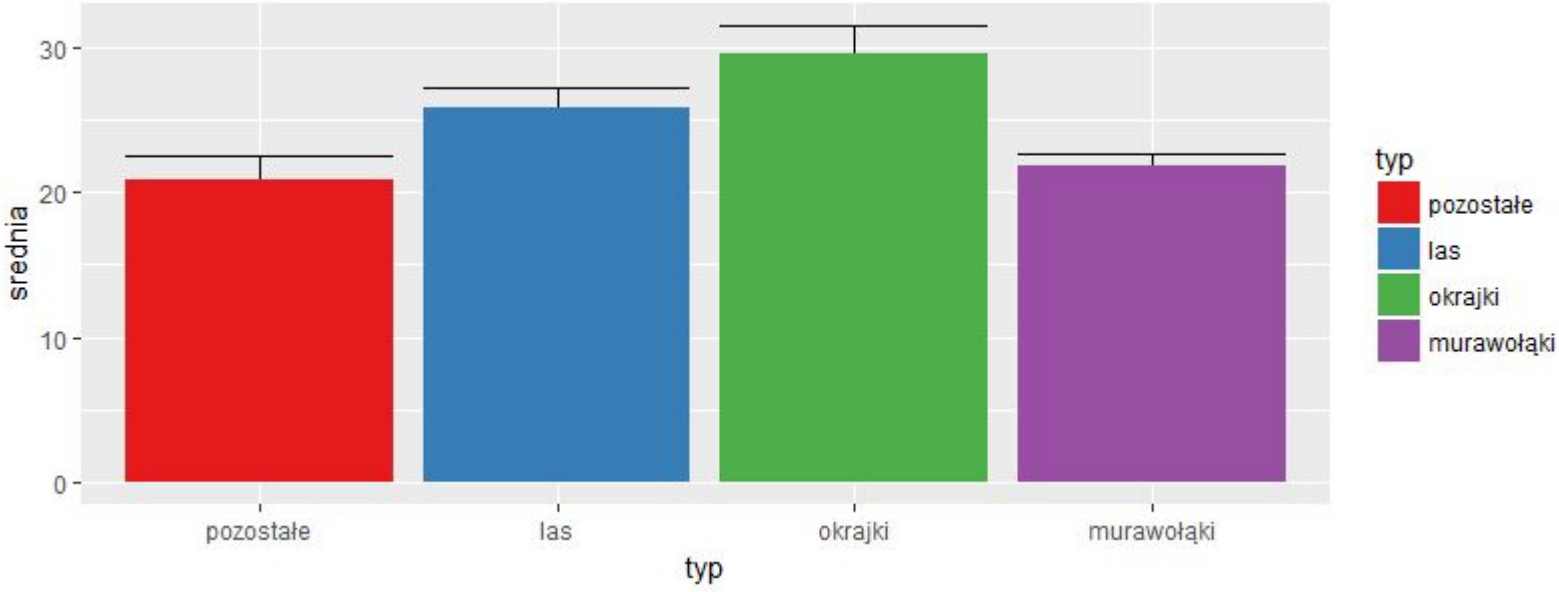
col = kolor obramowania

skale kolorów

ggplot(df, aes(x=typ,y=srednia,fill=typ))+geom_errorbar(aes(ymin=srednia-se,ymax=srednia+se)) +geom_col()



```
ggplot(df, aes(x=typ,y=srednia,fill=typ))
+geom_errorbar(aes(ymin=srednia-se,ymax=srednia+se))
+geom_col()+scale_fill_brewer(palette='Set1')
```



http://colorbrewer2.org/ - palety

Number of data classes: 3

Nature of your data:
(•) sequential ( ) diverging ( ) qualitative

Pick a color scheme:
Multi-hue: Single hue:

Only show:
- [ ] colorblind safe
- [ ] print friendly
- [ ] photocopy safe

Context:
- [ ] roads
- [ ] cities
- [x] borders

Background:
(•) solid color ( ) terrain

color transparency

3-class BuGn

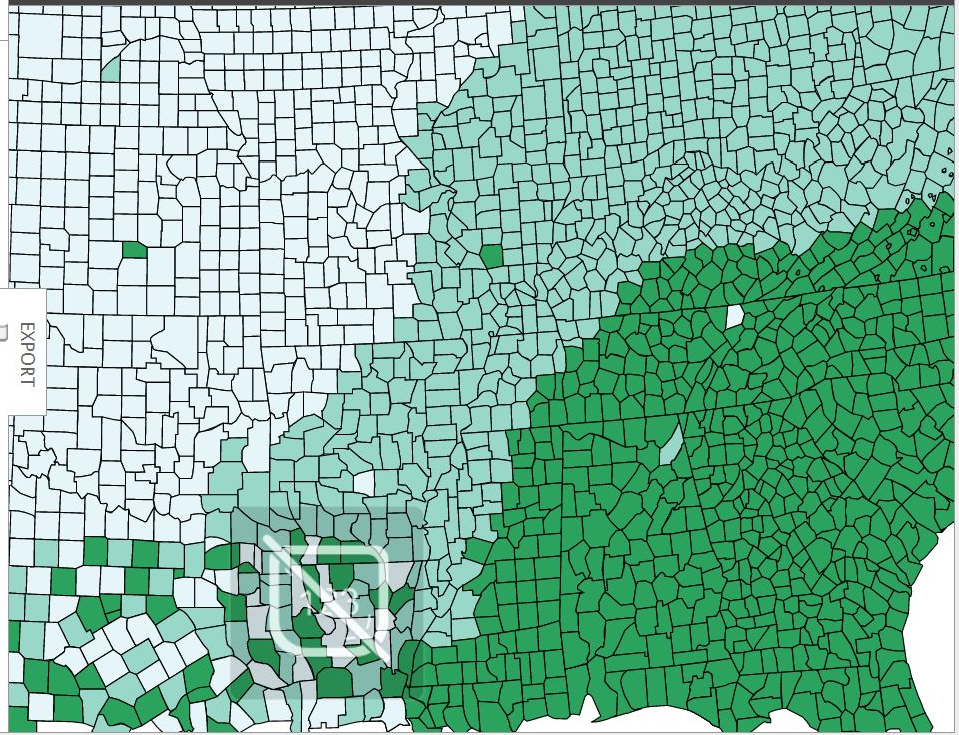
EXPORT

HEX

#e5f5f9
#99d8c9
#2ca25f

how to use | updates | downloads | credits

COLORBREWER 2.0
color advice for cartography



Odebrane (3) - marcin.dy | Mój dysk – Dysk Google | Eksploracja danych - Pre | mkdyderski/BSS: Białowi | ColorBrewer: Color Advic

colorbrewer2.org/#type=diverging&scheme=RdBu&n=5

Nauka | Czasopisma | R | Scholar | Biblioteka | SM_POL | WD | RG | bazy | When are traits funct | Long-term changes i | Invasive alien species | Boom-bust dynamics

Number of data classes: 5

Nature of your data:
sequential (diverging) qualitative

Pick a color scheme:

Only show:
- colorblind safe
- print friendly
- photocopy safe

Context:
- roads
- cities
- borders

Background:
- solid color
- terrain

color transparency

5-class RdBu

EXPORT

HEX

#ca0020
#f4a582
#f7f7f7
#92c5de
#0571b0

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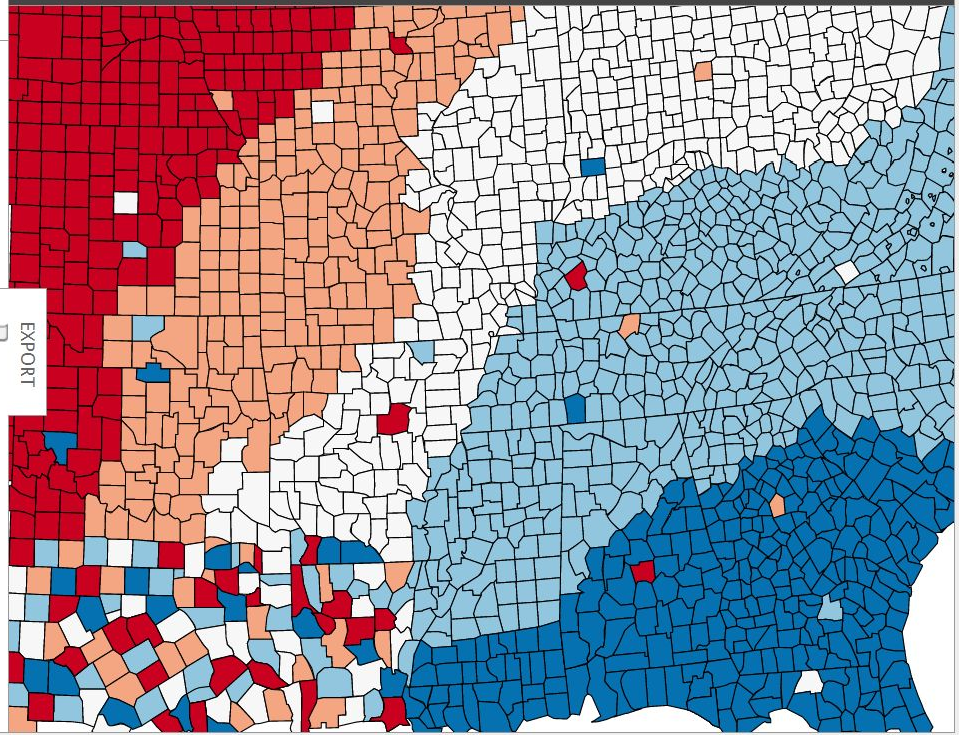
COLORBREWER 2.0
color advice for cartography



tidyverse_1.2.1.tar.gz | BSS skurwione po ....zip | Pokaż wszystkie

10:56
16.04.2018

Odebrane (3) - marcin.dy | Mój dysk – Dysk Google | Eksploracja danych - Pre | mkdyderski/BSS: Białowi | ColorBrewer: Color Advic

colorbrewer2.org/#type=qualitative&scheme=Set1&n=5

Nauka | Czasopisma | R | Scholar | Biblioteka | SM_POL | WD | RG | bazy | When are traits funct | Long-term changes i | Invasive alien species | Boom-bust dynamics

Number of data classes: 5

Nature of your data:
sequential | diverging | qualitative

Pick a color scheme:

Only show:
- colorblind safe
- print friendly
- photocopy safe

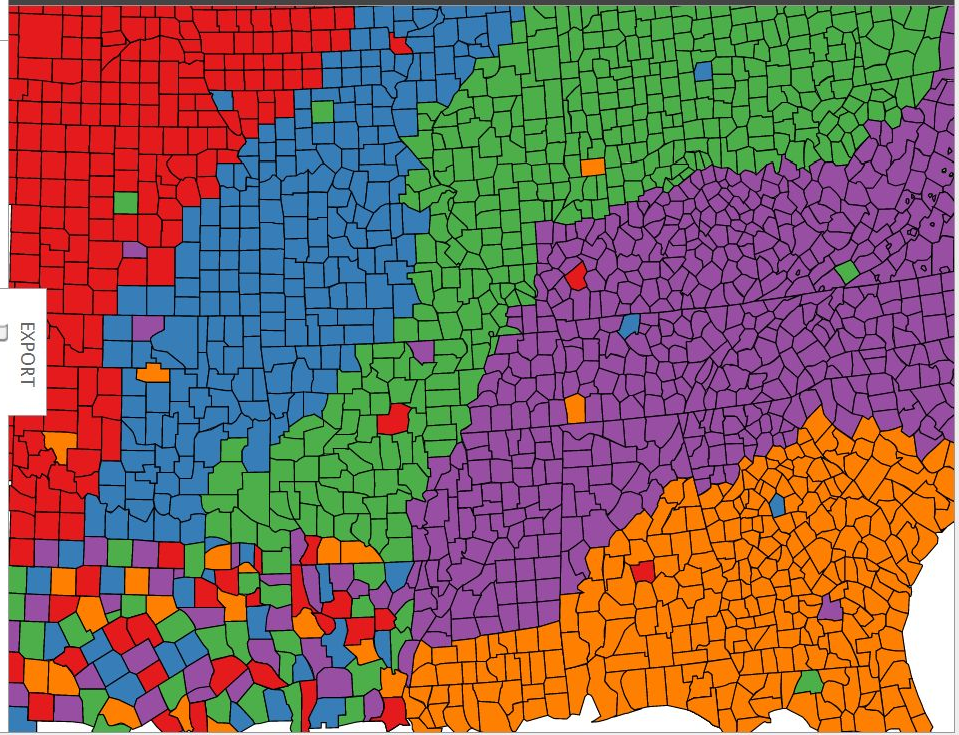
Context:
- roads
- cities
- borders

Background:
- solid color
- terrain

color transparency

how to use | updates | downloads | credits

COLORBREWER 2.0
color advice for cartography



5-class Set1

EXPORT

HEX

#e41a1c
#377eb8
#4daf4a
#984ea3
#ff7f00

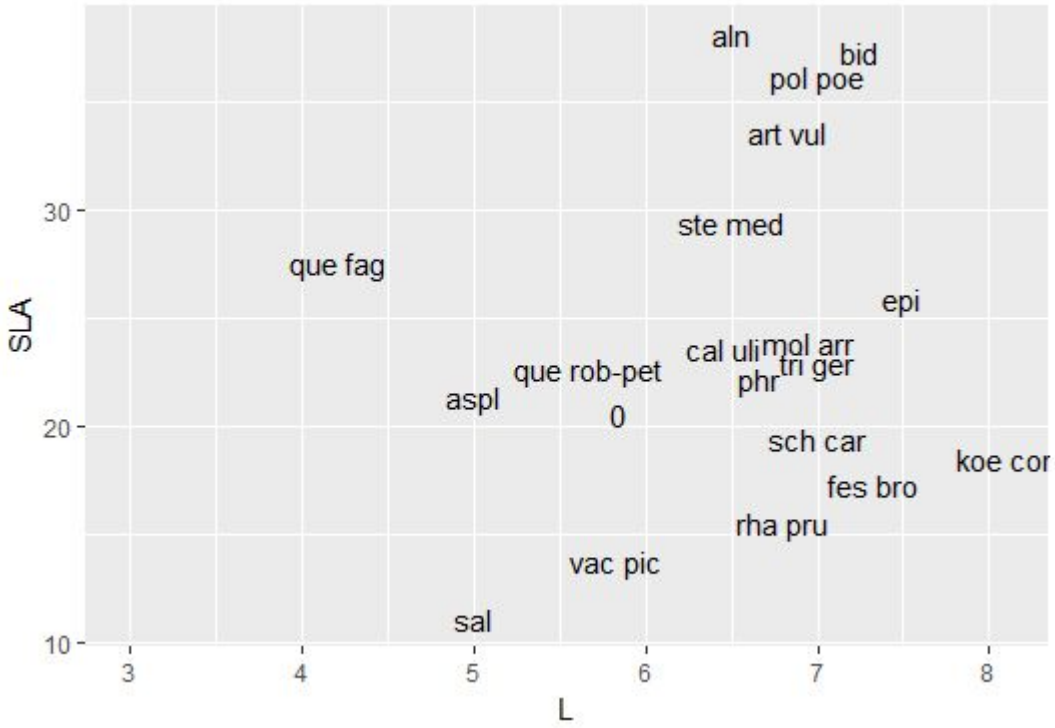
tidyverse_1.2.1.tar.gz | BSS skurwione po ....zip | Pokaż wszystkie

10:56
16.04.2018

Analiza danych zagregowanych

```
eks2<-eks%>%filter(!is.na(class))%>%group_by(class)%>%summarise_all(mean, na.rm=T)

ggplot(eks2, aes(x=L,y=SLA))+geom_text(aes(label=class))
```


aln
bid
pol poe
art vul
ste med
que fag
epi
cal uli
mol arr
tri ger
que rob-pet
phr
aspl
0
sch car
koe cor
fes bro
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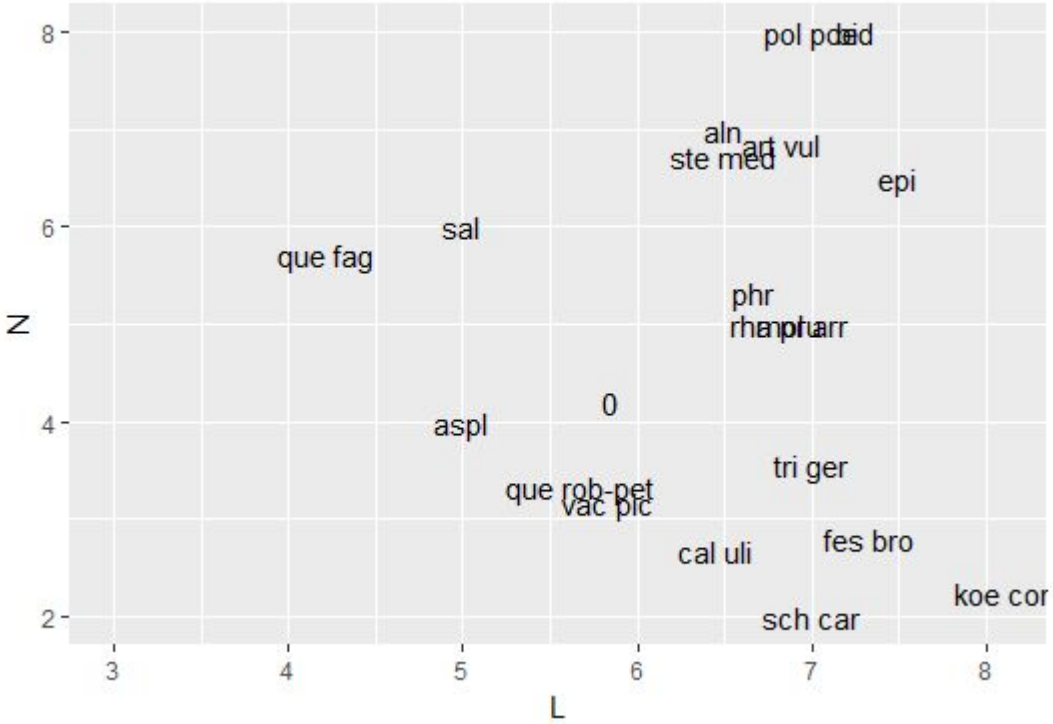
8
L

brzydkie?


8
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7
8
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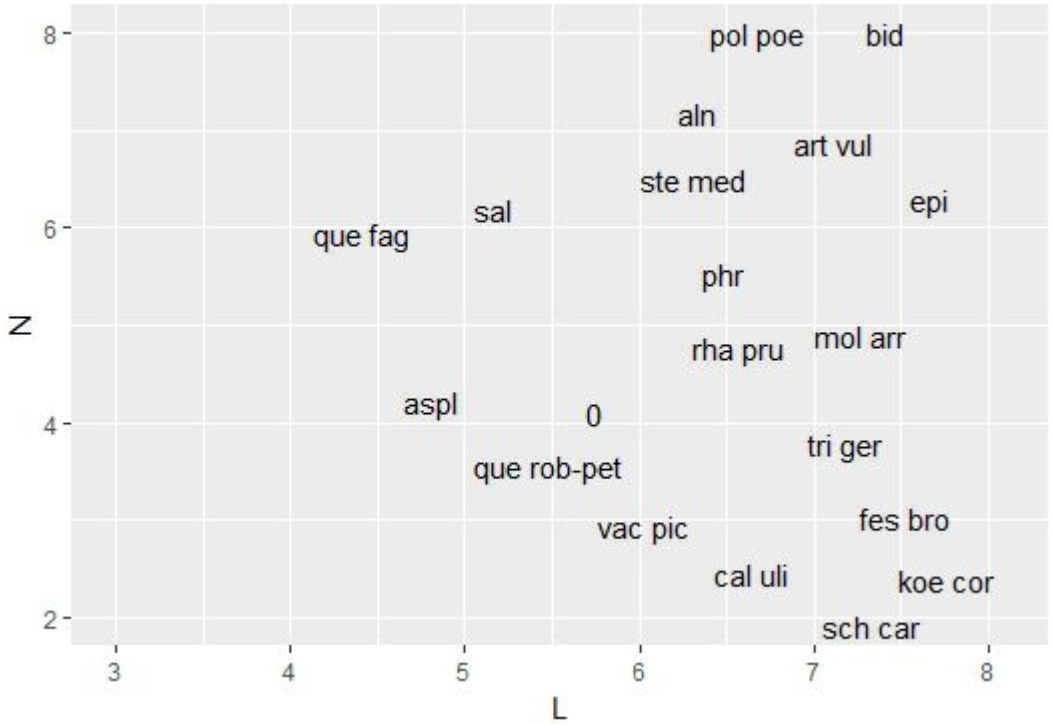
aln
art vul
ste med
epi
sal
que fag
phr
0
aspl
tri ger
que rob-pet
vac pic
fes bro
cal uli
koe cor
sch car

```
library(ggrepel)
ggplot(eks2, aes(x=L,y=N))+geom_text_repel(aes(label=class))
```



Zastosowania - interakcja z ggplot

```
df<-eks%>%filter(!is.na(SLA))%>%group_by(typ)%>%summarise(srednia=mean(SLA),se=se(SLA))

ggplot(df, aes(x=typ,y=srednia))+geom_errorbar(aes(ymin=srednia-se,ymax=srednia+se))+geom_col()
```

```
df<-eks%>%filter(!is.na(SLA))%>%group_by(typ)%>%summarise(srednia=mean(SLA),se=se(SLA))%>% ggplot(aes(x=typ,y=srednia))+geom_errorbar(aes(ymin=srednia-se,ymax=srednia+se))+geom_col()
```

Zastosowania - interakcja z ggplot

włączanie “rurek” w ggplot():

```
ggplot(subset(eks,SLA<100), aes(x=strategy,y=SLA))+geom_violin()
```

```
ggplot(eks%>%filter(SLA<100), aes(x=strategy,y=SLA))+geom_violin()
```

Zastosowania - porównanie grup

można przygotować obrazek ale potem trzeba zrobić test statystyczny...


BSS
BIAŁOWIESKA SZKOŁA STATYSTYKI