



Epidemiology of
Campylobacter spp. in
gulls in Croatia following
the “One Health” concept

Luka Jurinović
Croatian Veterinary institute





This work has been fully supported by Croatian Science Foundation under the project (UIP-2020-02-2528)

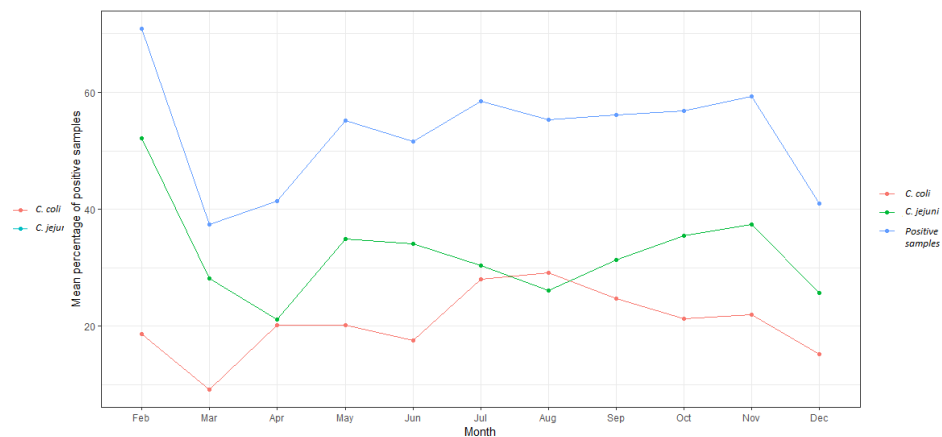
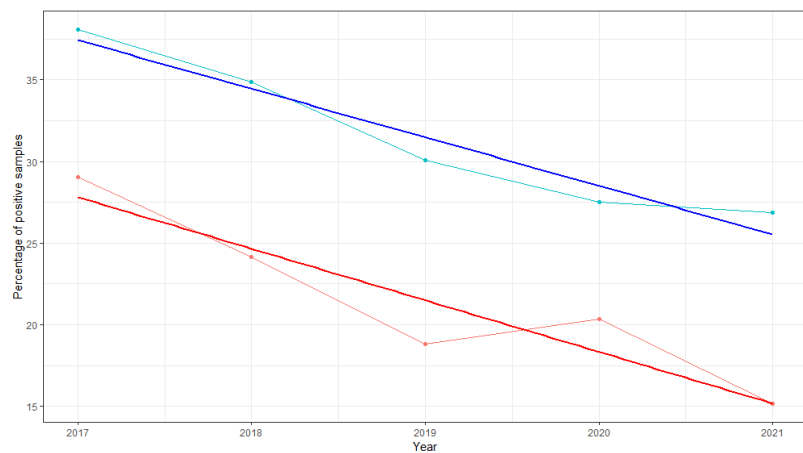


Epidemiology of *Campylobacter jejuni* in Yellow-legged Gulls, *Larus michahellis* in Croatia following "One Health" concept



- Monitoring of *Campylobacter* in broilers since 2007
- Since 2022 also in fattening turkeys
- Only *C. jejuni* and *C. coli*

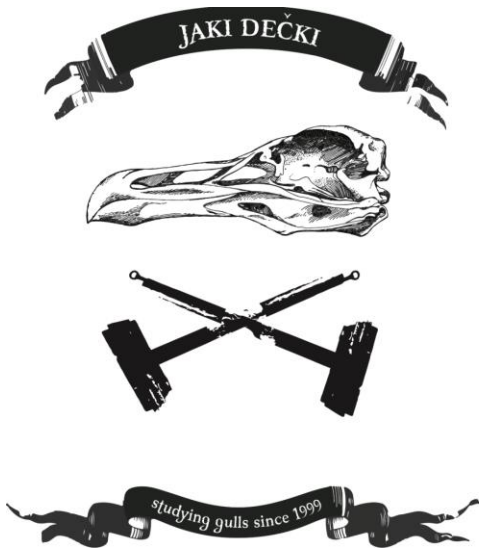
Year of sampling	Samples (n)	Positive samples (n)	Positive <i>C. coli</i>	Positive <i>C. jejuni</i>
2017	366	245 (66,94%)	106 (28,96%)	139 (37,98%)
2018	333	198 (59,46%)	81 (24,32%)	117 (35,14%)
2019	399	195 (48,87%)	75 (18,80%)	120 (30,08%)
2020	352	169 (48,01%)	72 (20,45%)	97 (27,56%)
2021	264	111 (42,05%)	40 (15,15%)	71 (26,89%)
Total	1711	918 (53,56%)	374 (21,82%)	544 (31,74%)



Why gulls?

- Opportunistic
- Coexist with people
- Extremely mobile
- Long-lived

- I study gulls since 1999



How do we catch gulls?

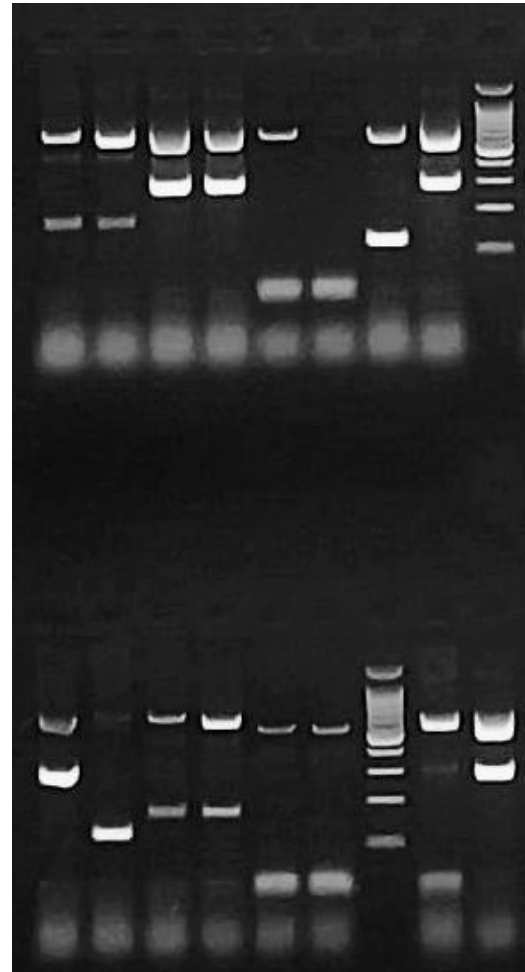
Breeding birds



How do we catch gulls?

Nonbreeding birds





November 2016 - March 2020

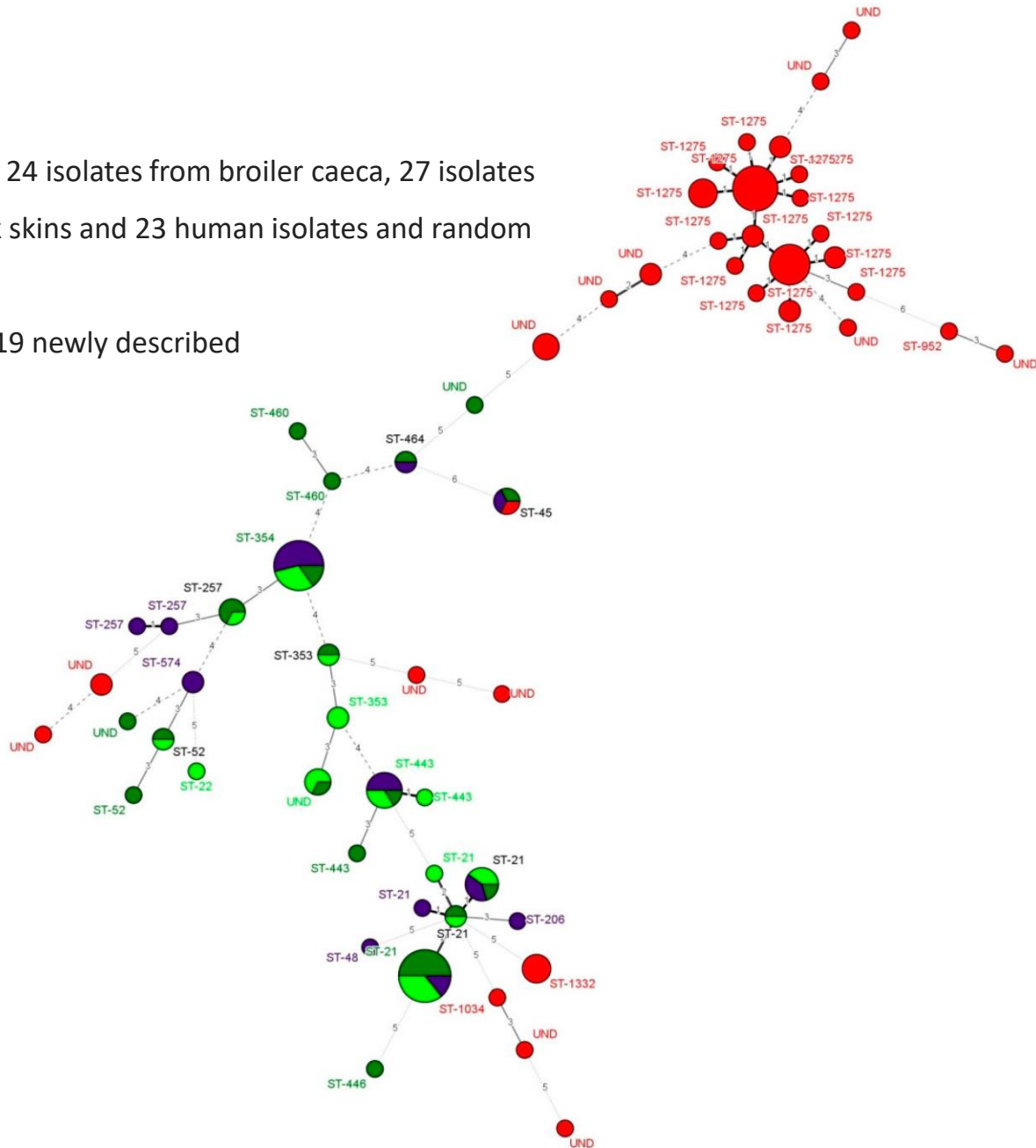
- 643 gulls sampled on Zagreb city rubbish tip
- 5 species
- 168 positive samples
- *C. jejuni* (148 or 88.1%) followed by *C. lari* (19 or 11.3%) and *C. coli* (1 or 0.6%)





- broiler neck skin
- broiler cecum
- human
- gull

- Comparison with 24 isolates from broiler caeca, 27 isolates from broiler neck skins and 23 human isolates and random 62 gull isolates
- 44 different STs, 19 newly described



August to October 2021

108 shellfish samples

78 mussels

27 scallops

3 oysters

20 *Campylobacter* positive

19 lari

1 jejuni

Only *C. jejuni* was ST 1268, which belongs to the ST-1275 CC



MLST *C. lari* isolates

13 STs, 9 new



Isolate	ST	<i>adk</i>	<i>atpA</i>	<i>glnA</i>	<i>glyA</i>	<i>pgi</i>	<i>pgm</i>	<i>tkt</i>
sh01	300	7	1	1	53	1	84	2
sh03	223	128	6	1	1	1	1	36
sh04	223	128	6	1	1	1	1	36
sh05	301	147	150	31	88	129	173	149
sh06	301	147	150	31	88	129	173	149
sh09	302	109	113	94	27	188	141	146
sh11	303	103	4	1	1	1	3	36
sh12	76	7	1	1	1	1	1	2
sh13	77	7	1	1	53	1	3	2
sh14	301	147	150	31	88	129	173	149
sh17	77	7	1	1	53	1	3	2
sh18	82	8	6	1	1	1	1	86
sh19	307	8	2	1	2	186	1	2
sh20	307	8	2	1	2	186	1	2
sh21	304	20	39	14	49	41	35	20
sh22	308	20	18	122	49	187	14	164
sh23	308	20	18	122	49	187	14	164
sh25	305	17	114	93	27	73	136	101
sh26	311	30	153	95	104	189	174	125

- temperature seasonality of *Campylobacter* spp.
- more frequent in colder seawater
- more than 25% of positive mussels



2022

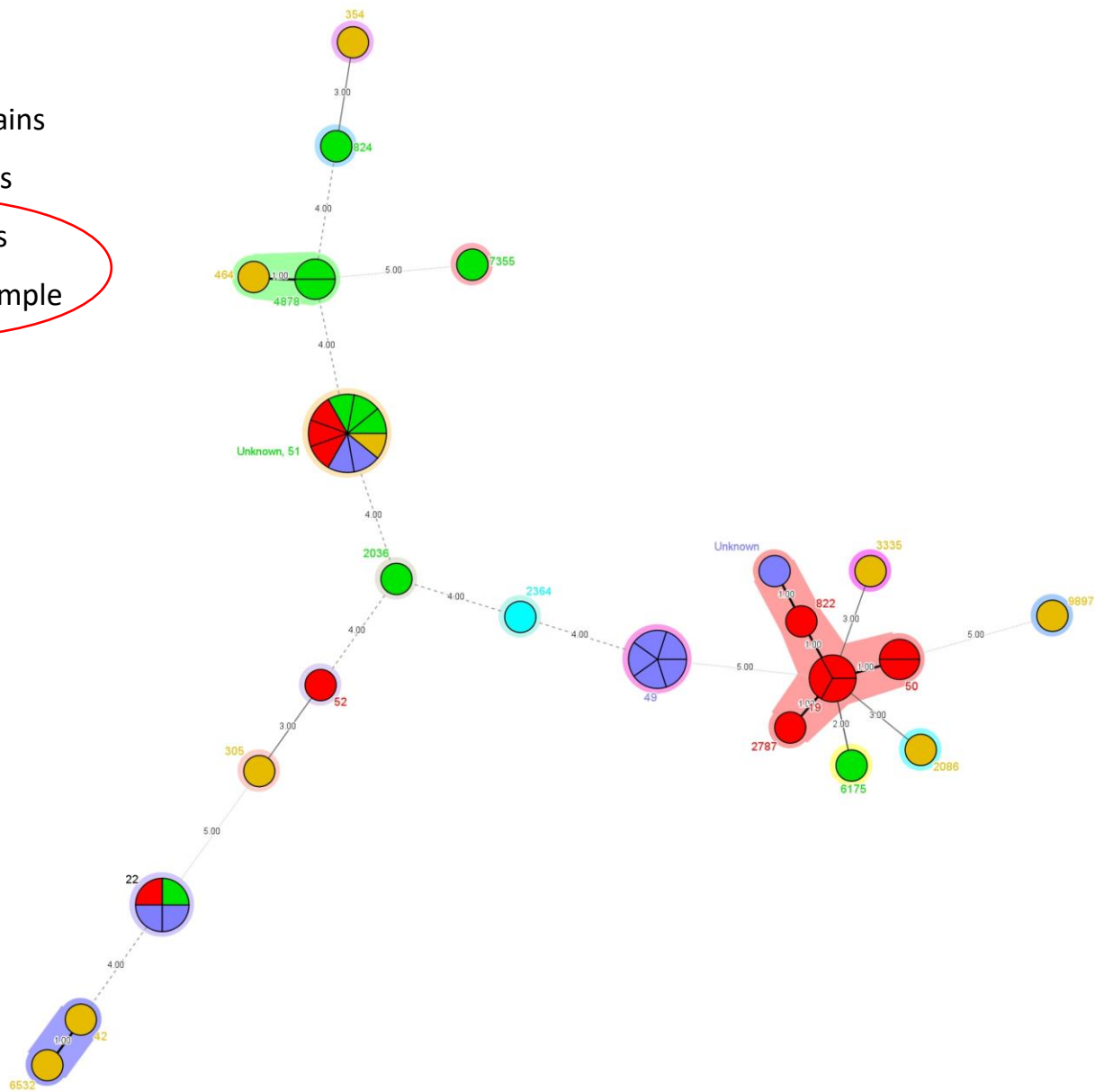
45 human *C. jejuni* strains

35 stool samples

9 blood samples

1 spinal fluid sample

- ST
- ZG
- ZGI
- PU
- OS



2023

23 Croatian ST-21 CC *C. jejuni* strains from different sources

8 human strains

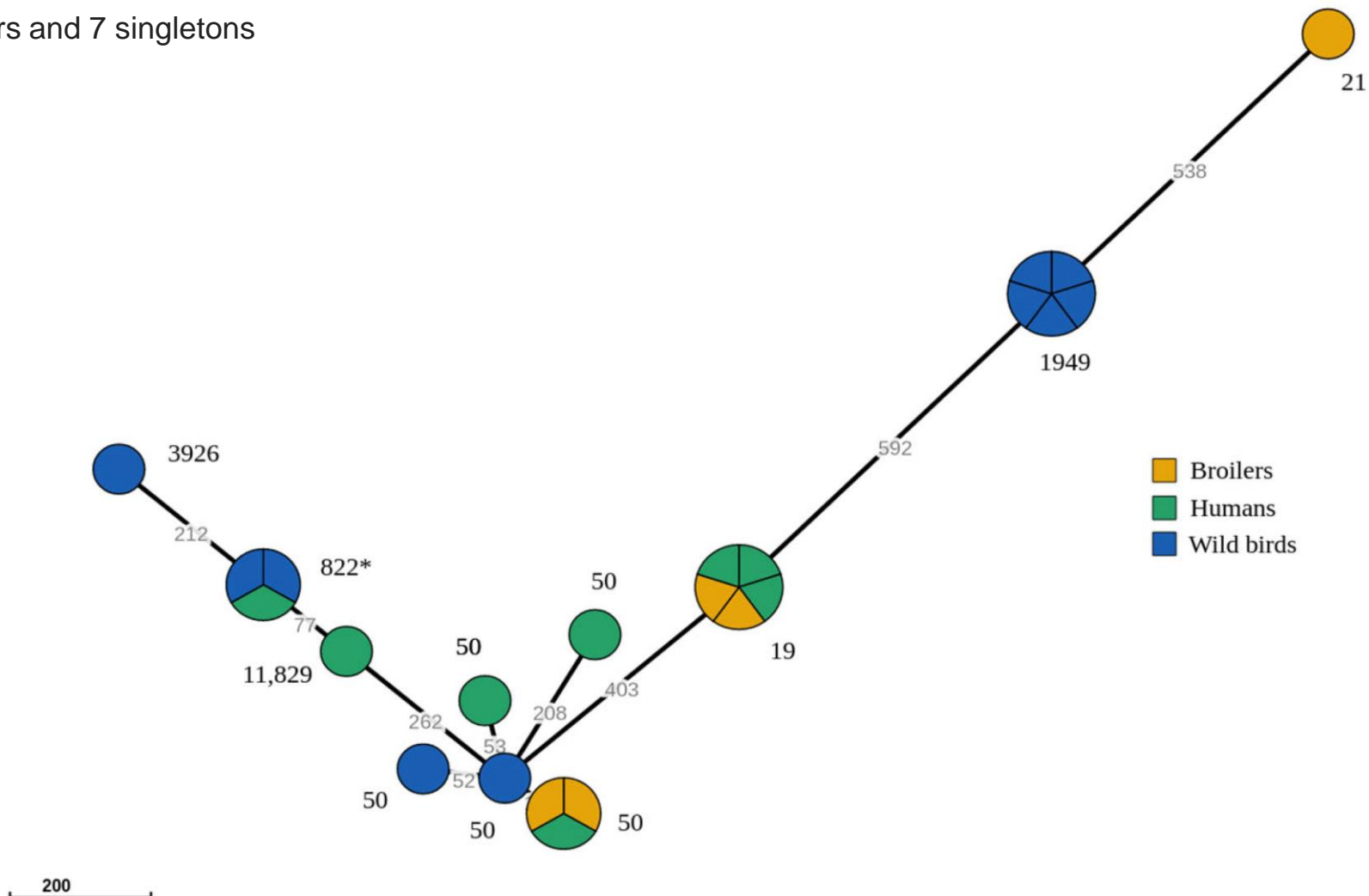
5 strains from broilers

2 strains from gulls

8 strains from storks.



- on average 89.81% alleles assigned in cgMLST scheme
- 4 clusters and 7 singletons



2017-2022

1753 gulls of 5 species tested for the presence of *C. lari*

1143 in winter, and 610 during breeding season

64 *C.lari* isolates

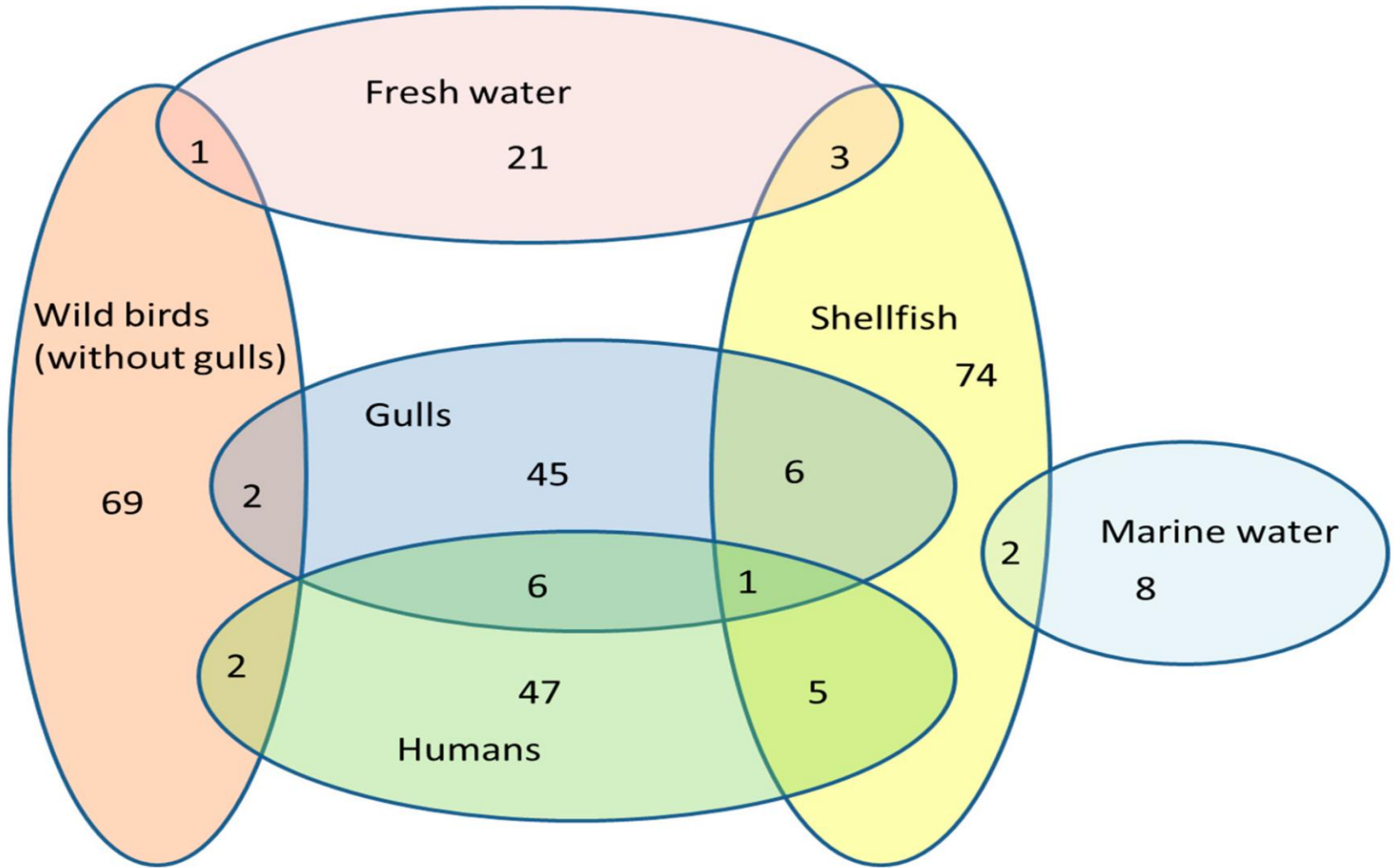
43 different STs, 31 newly described, 15 new alleles

most of isolates from two species

YLG 4,98%

BHG 1,13%







2021 to 2023 catching YLGs on 8 breeding colonies

- results

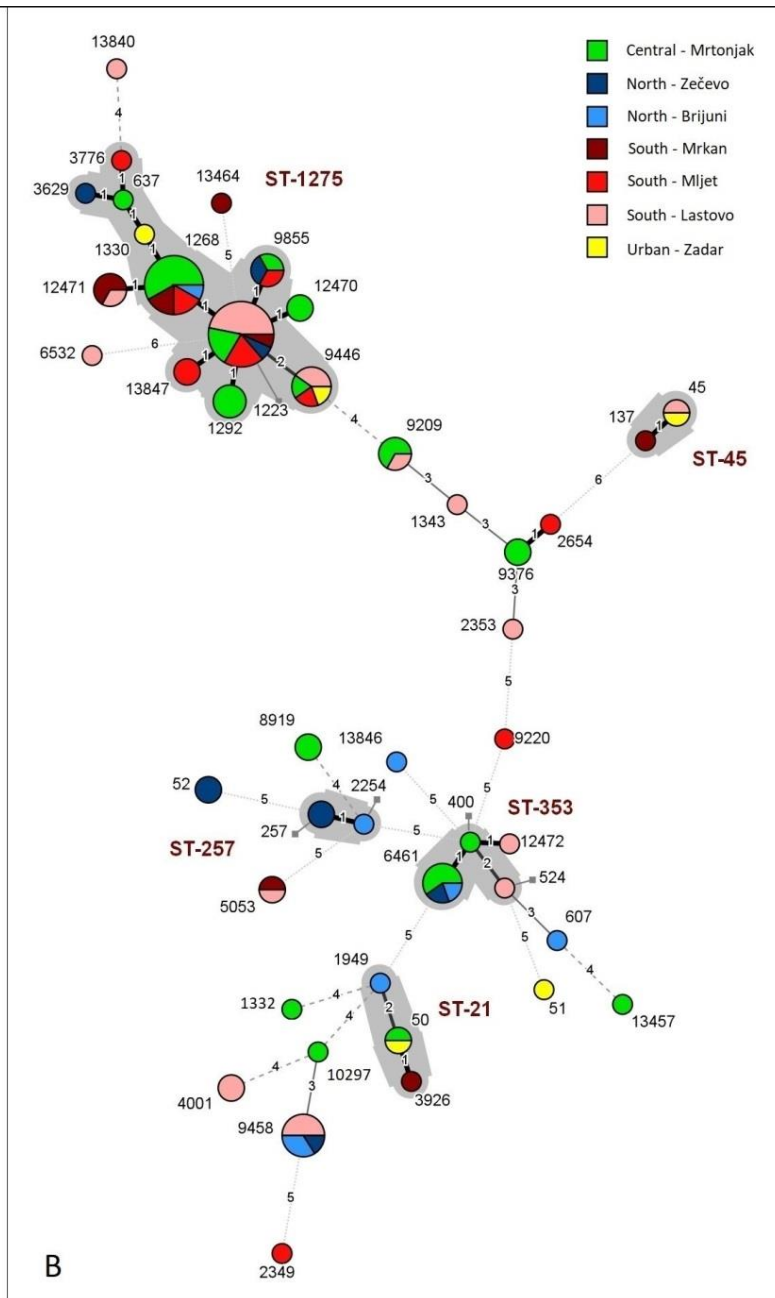
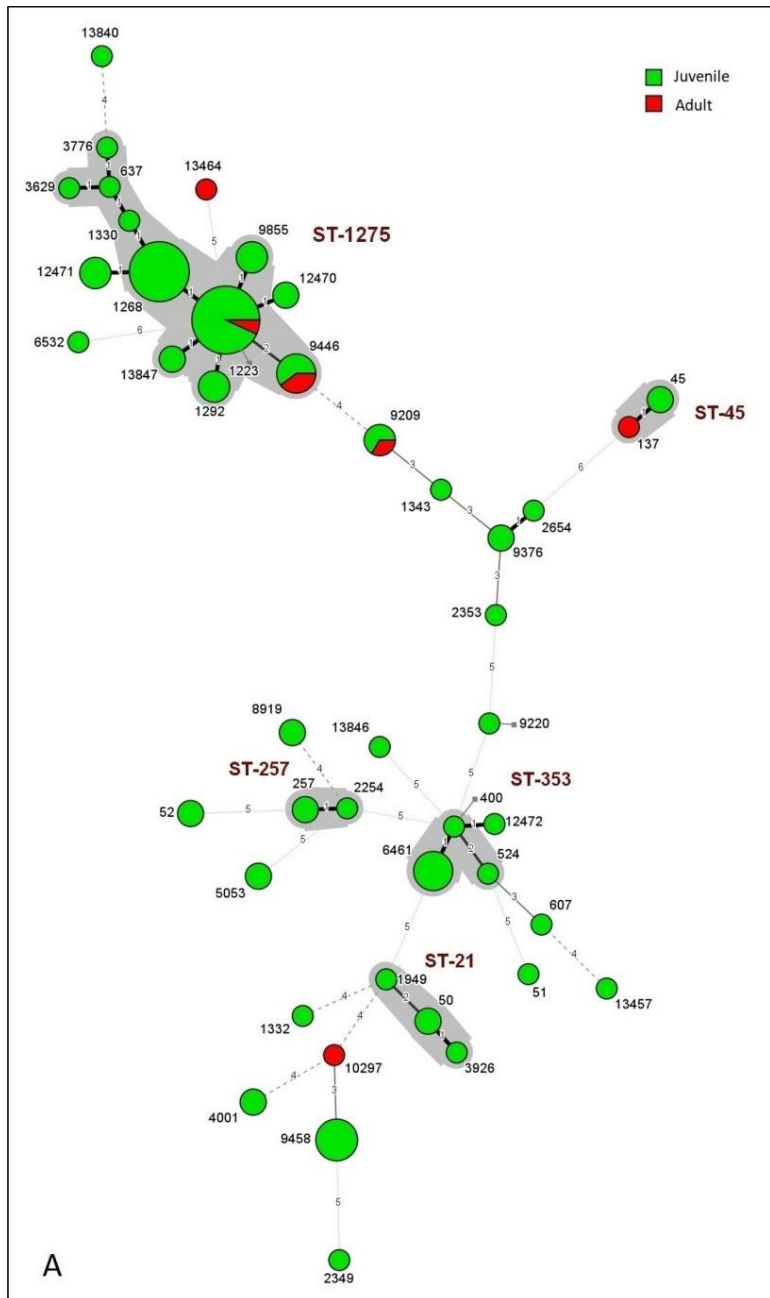


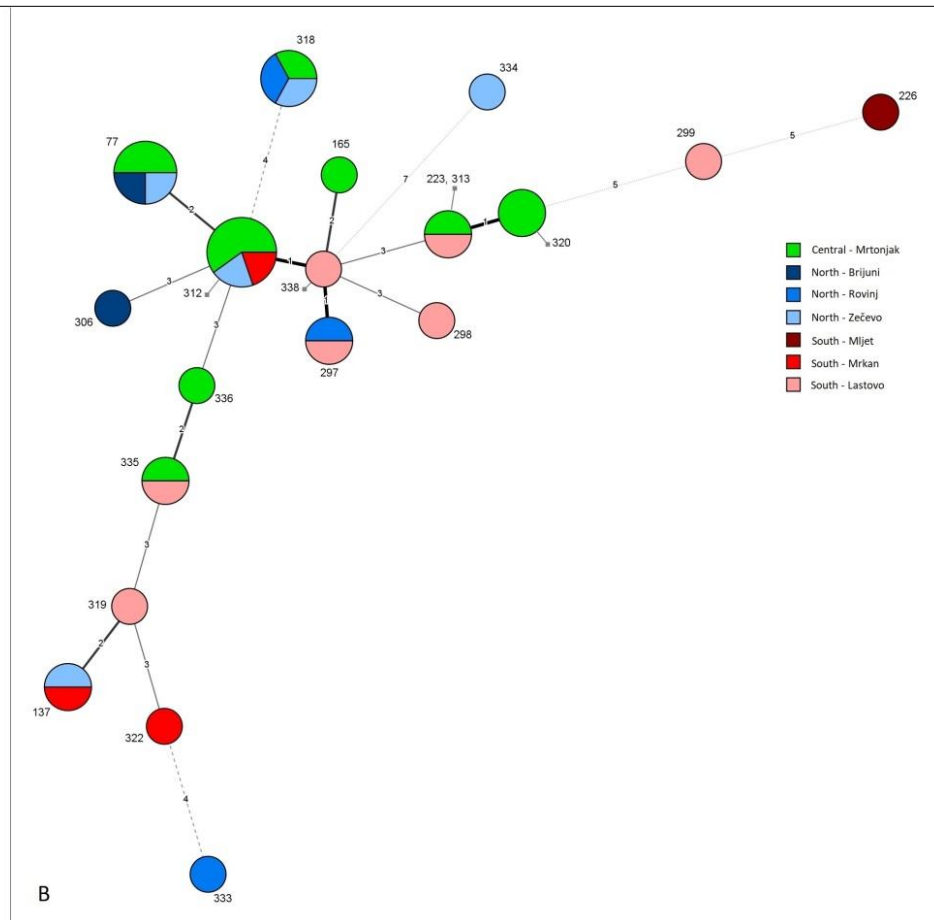
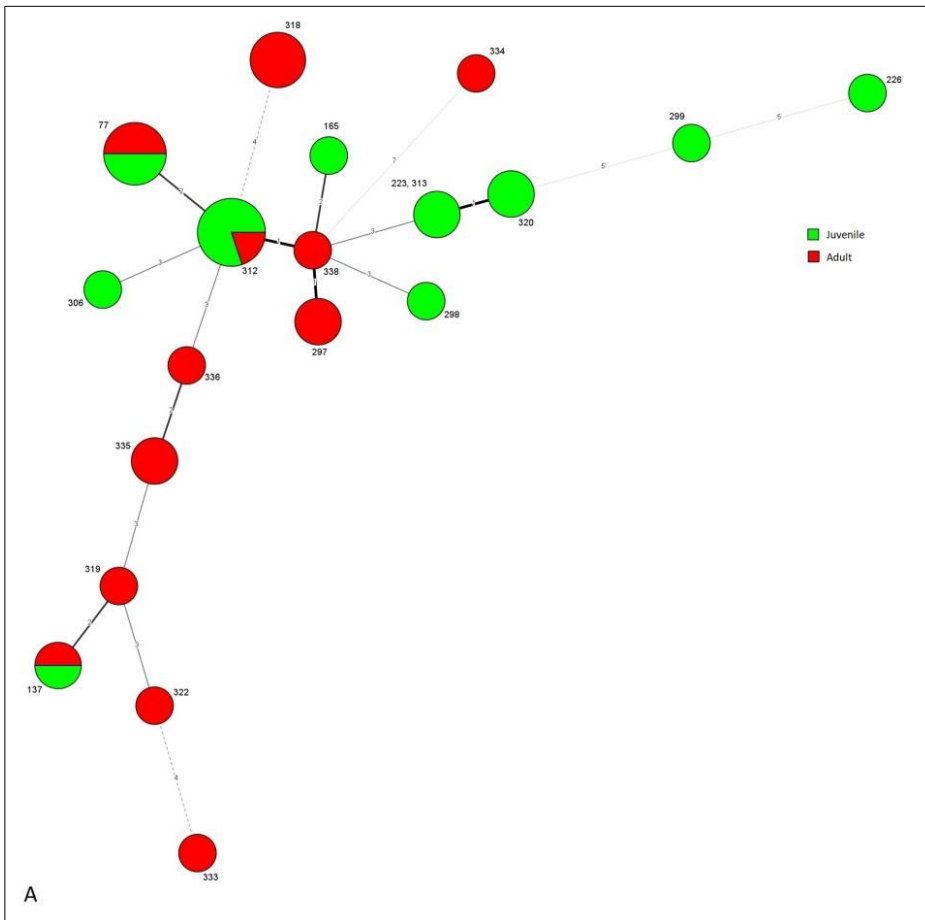
	Location	Rovinj	Brijuni	Zecevo	Zadar	Mrtonjak	Lastovo	Mljet	Mrkan	Total
	No. Samples /Age	46	84	134	57	178	191	174	207	1071
C. jejuni	adult	0	0	0	1	3	1	0	2	7
	nestlings	0	8	10	4	32	23	13	9	99
C. lari	adult	3	0	5	0	4	4	0	2	18
	nestlings	0	2	1	0	10	3	1	1	18
C. coli	adults	0	0	0	0	0	0	0	0	0
	nestlings	0	2	2	0	4	0	0	2	10
No. samples	adult	8	24	30	18	35	30	7	39	191
	nestlings	38	60	104	39	143	161	167	168	880
C. jejuni %		0,00	9,52	7,46	8,77	19,66	12,57	7,47	5,31	9,90
C. lari %		6,52	2,38	4,48	0,00	7,87	3,66	0,57	1,45	3,36
C. coli %		0,00	2,38	1,49	0,00	2,25	0,00	0,00	0,97	0,93
Campylobacter spp. %		6,52	14,29	13,43	8,77	29,78	16,23	8,05	7,73	14,19



Occurrence

- from 1071 gulls from which cloacal swabs were taken, 152 bacterial isolates (14.2 %) were identified as *Campylobacter* spp.
- *C. jejuni* was the most common (9.9 %), followed by *C. lari* (3.4 %) and *C. coli* (0.9 %).
- there are significant differences in the occurrence of *Campylobacter* spp. between the sites, but the reason for this is unknown.
- significant difference in the occurrence of *C. jejuni*, with nestlings showing a higher occurrence than adults





Genetic diversity

- High genetic diversity of *C. jejuni* and *C. lari*, both in adults and chicks. Chicks showed higher diversity, but without significant differences.
- Rapid replacement of genotypes, but some genotypes were found repeatedly over years and locations, such as ST-1275, suggesting longevity and host specificity of certain genotypes.
- Minimum spanning trees show no significant differences between ages groups and locations, suggesting that there is no clustering of certain genotypes.



2023

isolation of *C. volucris*



Conclusions

- although gulls live close to humans and often feed on rubbish dumps, they are not the primary reservoirs for *Campylobacter* genotypes that are pathogenic to humans
- animals that more frequently use antropogenic habitats are likely to play a more active role in epizootiological terms
- *C. lari* is a very active species and represents a potential public health risk that should be further investigated
- *C. volucris* is very rare 😊



Acknowledgments



stuff of Laboratory for bacteriology, Poultry Centre

project collaboratos

Zagreb City Holding Ltd, Subsidiary Čistoća

Jaki dečki

Partners on EpiCGulls project



NASTAVNI ZAVOD ZA JAVNO ZDRAVSTVO
ISTARSKE ŽUPANIJE-
ISTITUTO FORMATIVO DI SANITÀ
PUBBLICA DELLA REGIONE
ISTRIANA



Thank you for your attention!

