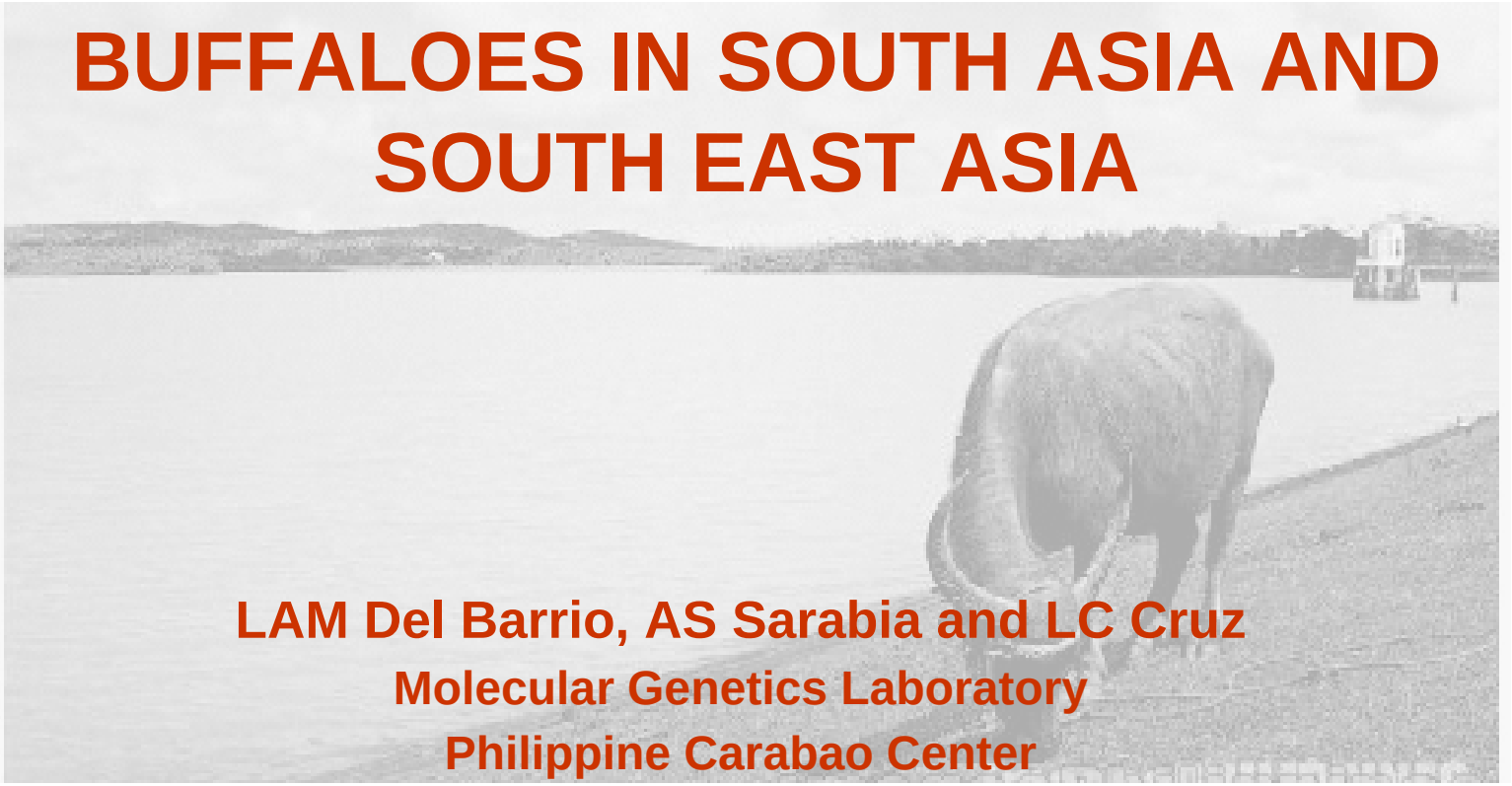
GENETIC RELATIONSHIP OF SWAMP BUFFALOES IN SOUTH ASIA AND SOUTH EAST ASIA



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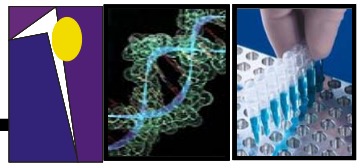
Mongolia
Korea
Japan
China
Pakistan
Tibet
Nepal
Taiwan
India
Bangladesh
Laos
Hong Kong
Macau
Burma
Thailand
Vietnam
Philippines
Cambodia
Brunei
Sri Lanka
Malaysia
Singapore
Indonesia

How to measure genetic relatedness?

1. Mitochondrial DNA (mtDNA)
2. Microsatellites
3. Protein coding loci

Molecular characterization of the Philippine carabao (*Bubalus bubalis* L.) from the major island groups of the Philippines using molecular cloning and sequence analysis of the D-loop of mitochondrial DNA

– **LAM del Barrio, CB dela Vina, MGN Yebron Jr., CAS Estrella, JRV Herrera, AN del Barrio**



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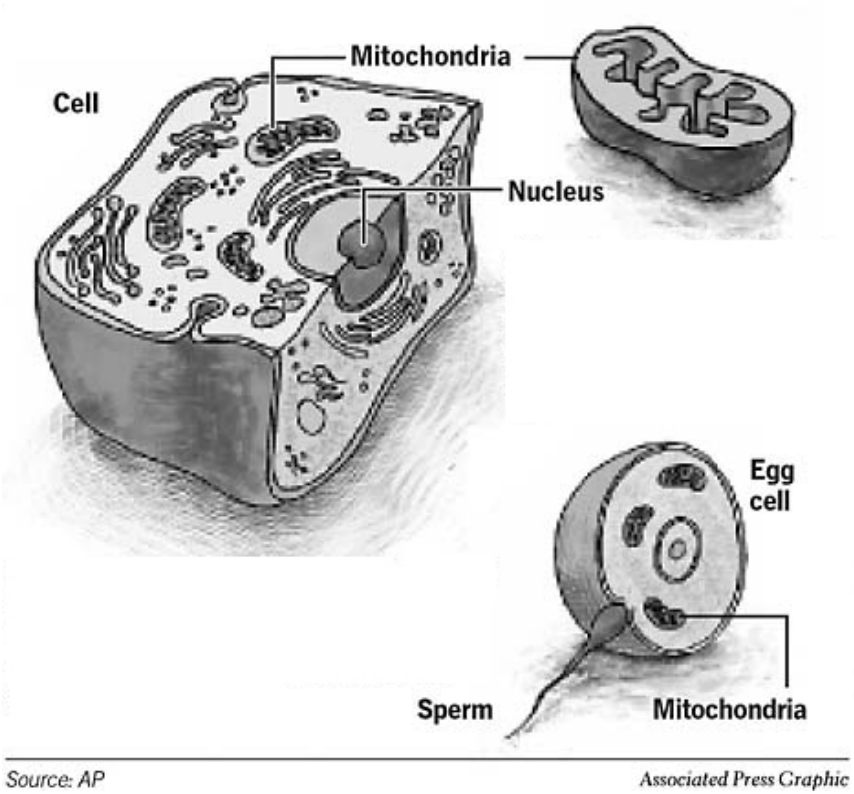
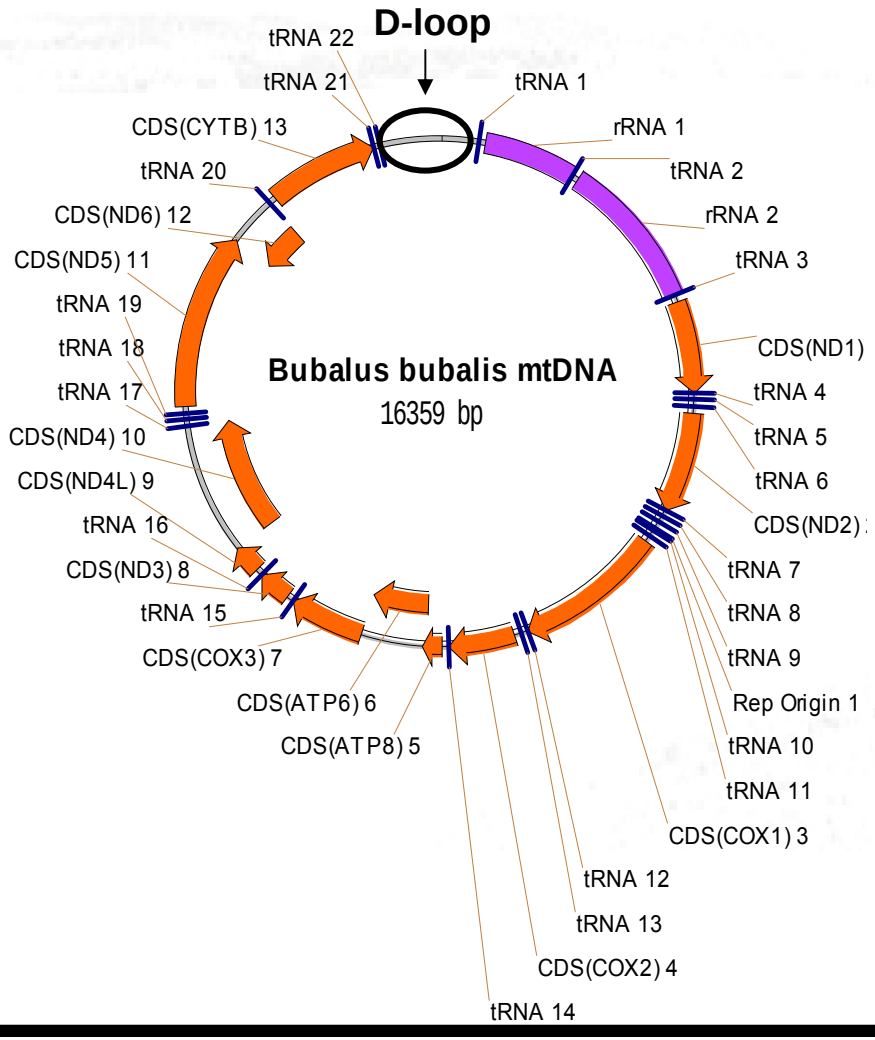
Mitochondrial DNA (mtDNA)

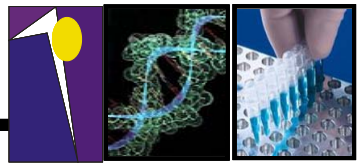


- Maternally inherited
- No recombination
- High rate of substitution
- Phylogenetic and relationship studies

mtDNA of Water Buffalo



- ~ 16 kb
- D-loop
  - Non-coding
  - Most variable region
  - 910 bases (Qian *et al.*, 2004)



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Philippine Carabao (*Bubalus bubalis* L.)

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Objectives

► To characterize the Philippine carabao at the molecular level through mtDNA sequence analysis

► To analyze the D-loop DNA sequences and compare them to sequences from different parts of the country and from other countries

Methodology

Sample Collection

▼

DNA Extraction

▼

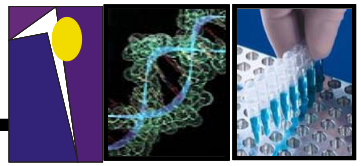
Optimization of Polymerase Chain Reactions (PCR)

▼

Molecular Cloning and Sequencing

▼

Sequence Analysis



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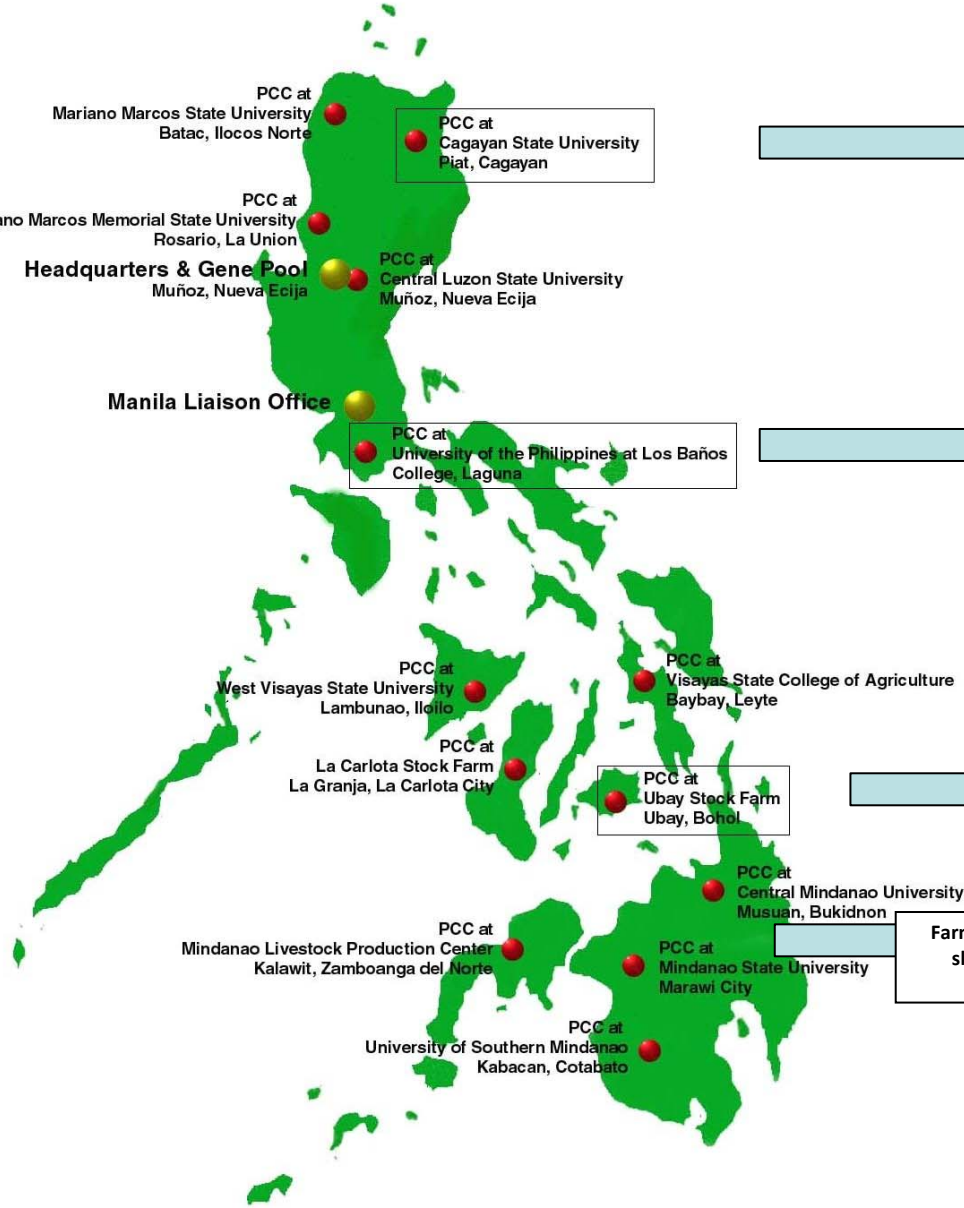


Northern Luzon

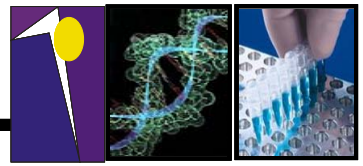
Southern Luzon

Northern Philippines (Luzon)

Central Philippines (Visayas)

Farmer cooperator and slaughter house in Bukidnon

Southern Philippines (Mindanao)



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Methodology

Sample Collection

▼

DNA Extraction

▼

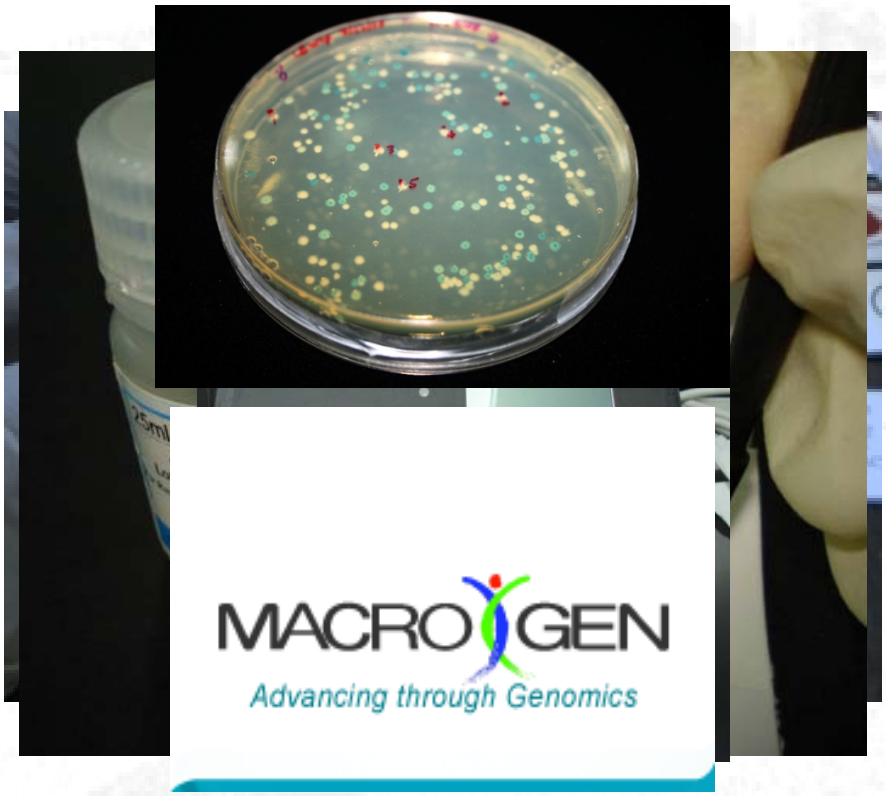
Optimization of Polymerase Chain Reactions (PCR)

▼

Molecular Cloning and Sequencing

▼

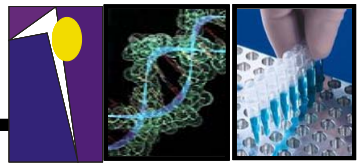
Sequence Analysis



Multiple Sequence Alignment Analysis

Island Group	Origin	Sample No.	GENBANK Accession No.
North Luzon	Cagayan	C1	FJ873680
		C9	FJ873681
South Luzon	Batangas	1	FJ873676
		5	FJ873677
Visayas	Bohol	B1	FJ873682
		B10	FJ873683
Mindanao	Bukidnon	A1	FJ873678
		A2	FJ873679

97.5 % homology



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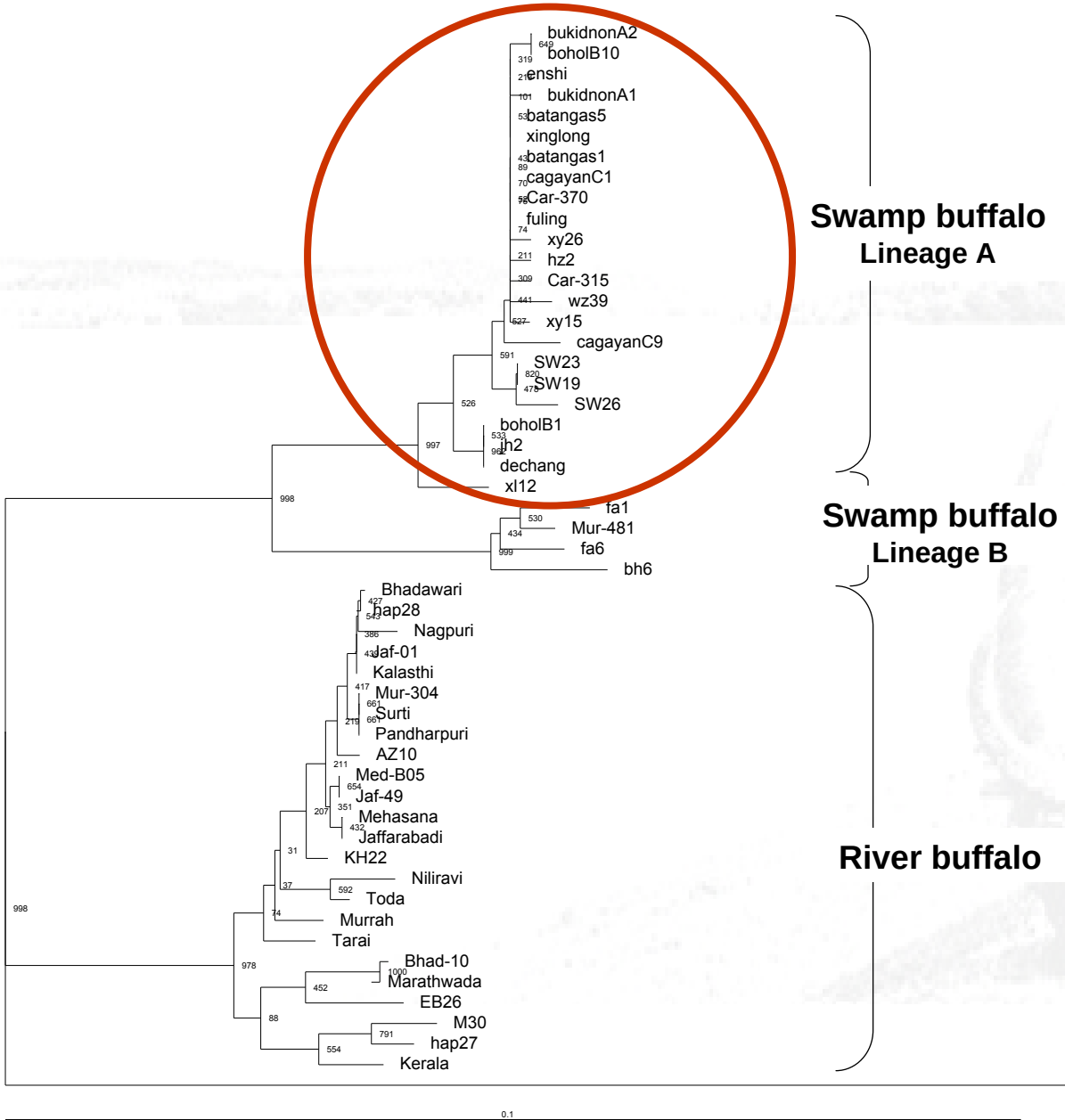
BLAST-N Analysis

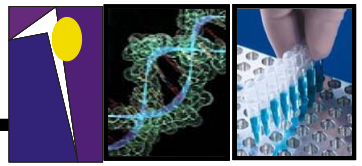
Island Group	Sample No.	BLAST Result	Origin	Homology
North Luzon	UPLB21	*Bubalus bubalis* isolate FuLing1213 D-loop, partial sequence	China	100 %
	UPLB26	*Bubalus bubalis* isolate FuLing1213 D-loop, partial sequence	China	99 %
South Luzon	UPLB1	*Bubalus bubalis* isolate FuLing1213 D-loop, partial sequence	China	100 %
	UPLB7	*Bubalus bubalis* isolate Xinglong-2105 control region, partial sequence	China	100 %
Visayas	UPLB31	*Bubalus bubalis* isolate Dechang-0163 control region, partial sequence	China	100 %
	UPLB36	*Bubalus bubalis* isolate Enshi-1803 control region, partial sequence	China	99 %
Mindanao	UPLB13	*Bubalus bubalis* isolate Xinglong-2105 control region, partial sequence	China	99 %
	UPLB16	*Bubalus bubalis* isolate FuLing1213 D-loop, partial sequence	China	99 %


bukidnonA2
649
319
boholB10
enshi
bukidnonA1
101
53
batangas5
xinglong
batangas1
89
70
cagayanC1
Car-370
74
fuling
xy26
211
hz2
309
Car-315
441
wz39
527
xy15
cagayanC9
591
SW23
820
475
SW19
SW26
526
boholB1
533
997
h2
dechang
xl12
998
fa1
530
Mur-481
434
fa6
999
bh6
Bhadawari
427
hap28
543
Nagpuri
386
Jaf-01
Kalasthi
417
Mur-304
661
Surti
219
661
Pandharpuri
AZ10
211
Med-B05
654
Jaf-49
207
351
Mehasana
432
Jaffarabadi
31
KH22
Niliravi
37
592
Toda
998
74
Murrah
Tarai
978
Bhad-10
1000
Marathwada
452
EB26
88
M30
791
hap27
554
Kerala
0.1
Swamp buffalo
Lineage A
Swamp buffalo
Lineage B
River buffalo

Findings

- Sequence analysis of Philippine carabao isolates from the major island groups presented a 97.5% homology.

- BLAST-N analysis showed the probable maternal line of the Philippine carabaos, which is the Chinese buffalo.

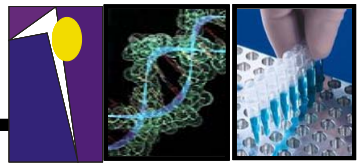


Findings

- Rooted phylogenetic tree confirmed that the Philippine carabao belongs to Lineage A of swamp buffaloes and that it is closely related to the Chinese buffaloes.

Genetic variation within and relationships among populations of Asian water buffalo (*Bubalus bubalis*)

- JSF Barker, SG Tan, OS Selvaraj, TK Mukherjee
- Animal Genetics 1997, 28, 1-13



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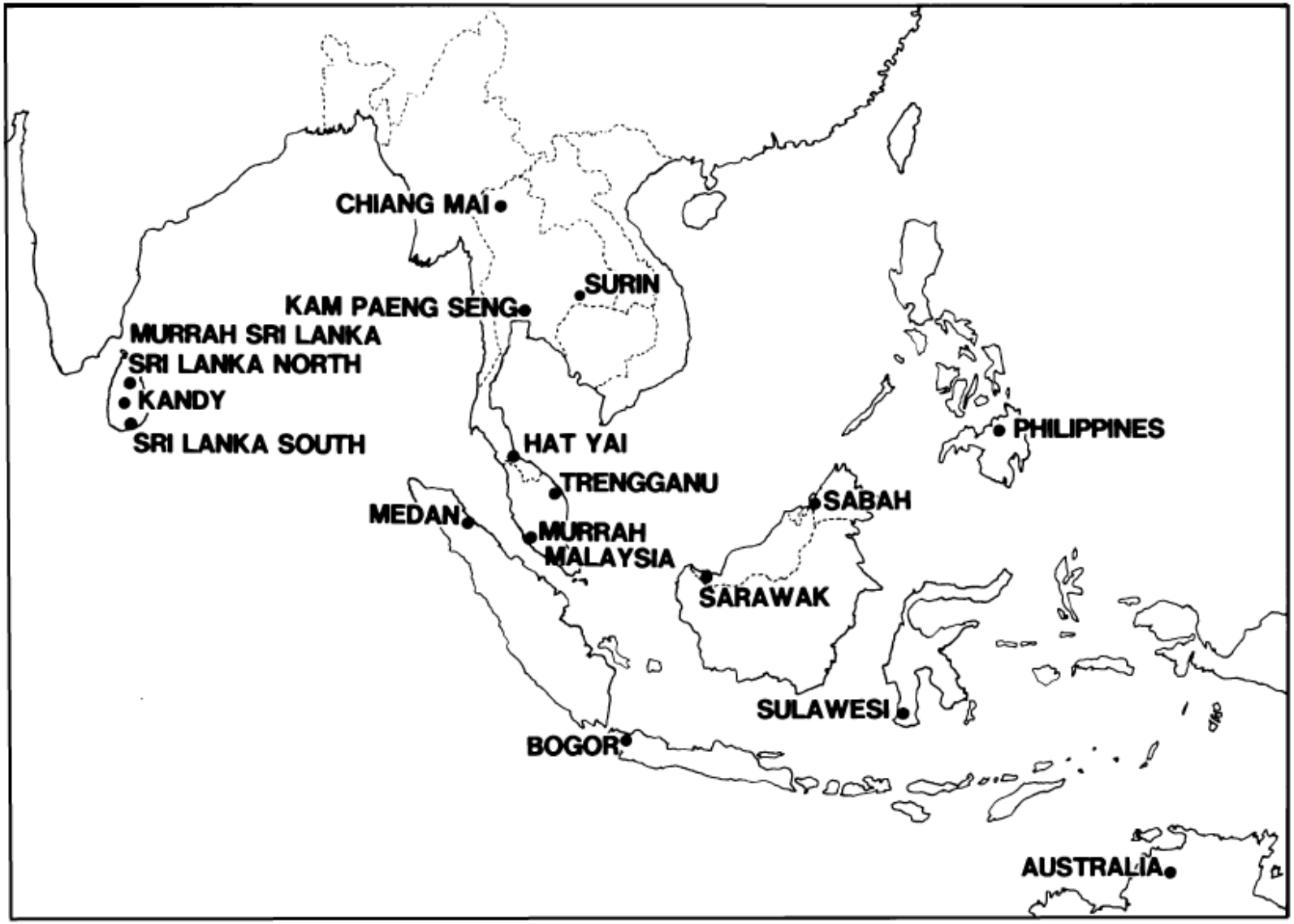
Background

- 53 protein coding loci
- 12 swamp buffalo
  - Thailand, Malaysia, Philippines, Indonesia, Australia



Findings

- Significant genetic differentiation among populations of swamp types

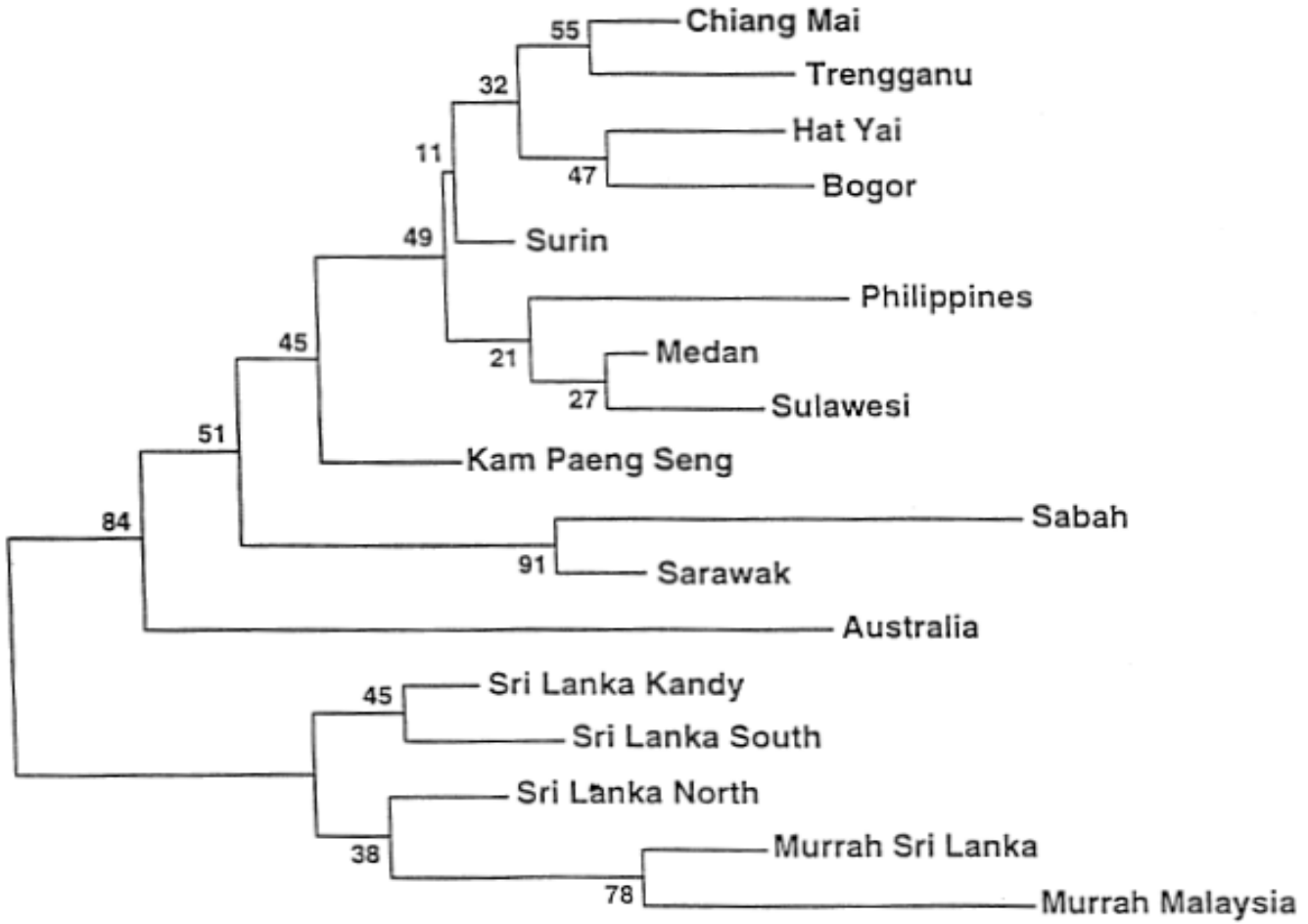
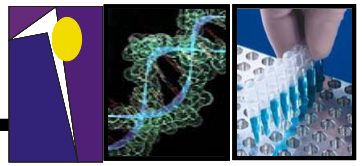


Fig. 2. Dendrogram of relationships among 17 water buffalo populations, using D_A genetic distances (Table 7) based on 53 protein coding loci, and the neighbour-joining method of clustering. Numbers on the nodes are percentage bootstrap values from 1000 replications of resampled loci.

Genetic diversity of Asian water buffalo (*Bubalus bubalis*): microsatellite variation and a comparison with protein coding loci

- JSF Barker, SS Moore, DJS Hetzel, D Evans, SG Tan, K Byrne
- Animal Genetics 1997, 28, 103-115



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Background

- 25 polymorphic protein coding loci
- 21 microsatellite loci
- 8 swamp buffalo
  - Thailand, Malaysia, Philippines, Indonesia, Australia

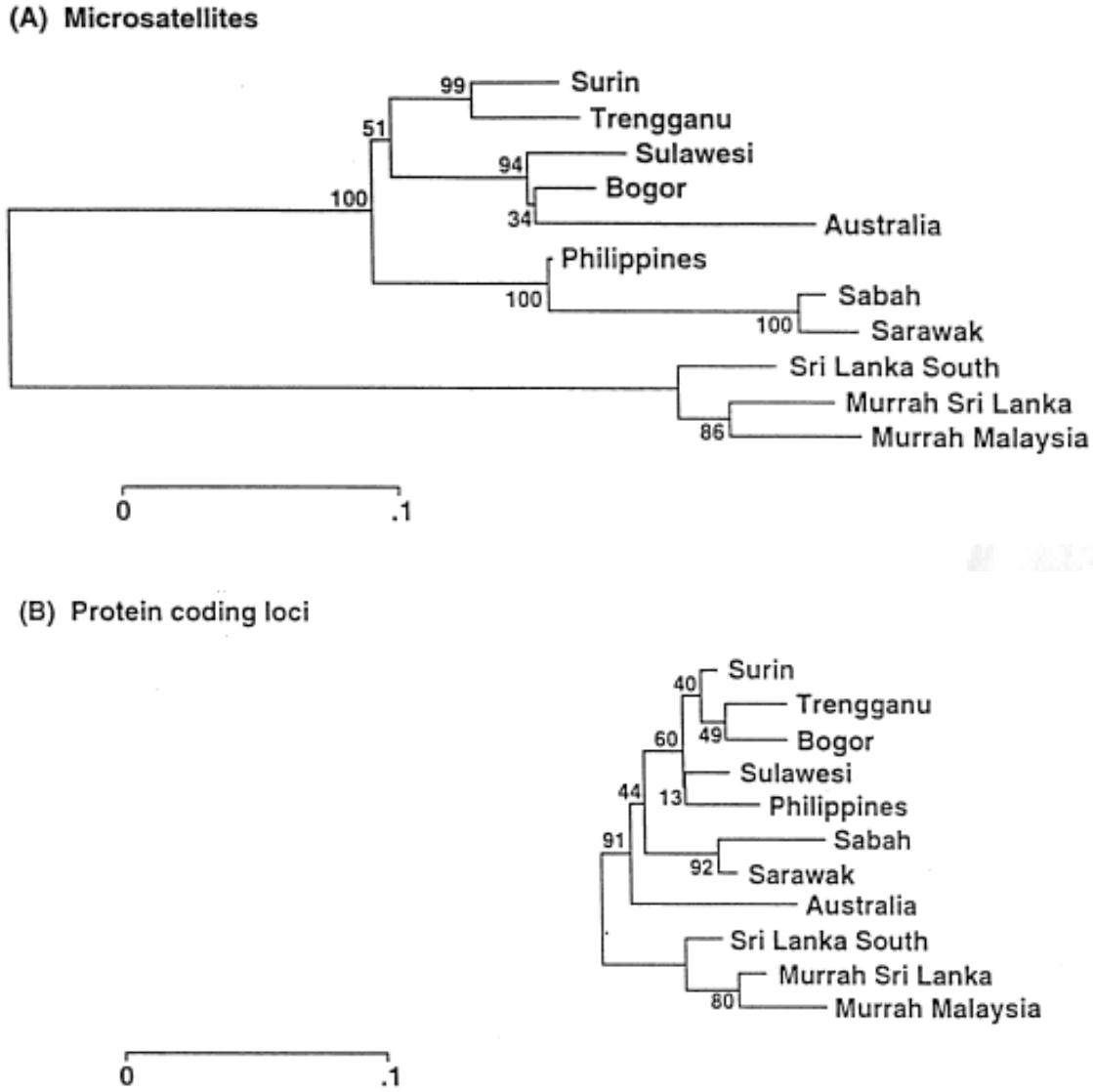


Fig. 3. Dendrograms of relationships among 11 water buffalo populations, using D_A genetic distances and the neighbour-joining method of clustering, which were based on (A) 21 polymorphic microsatellite loci, and (B) 25 polymorphic protein-coding loci. Numbers on the nodes are percentage bootstrap values from 1000 replications of resampled loci, and a scale bar for branch lengths is shown.

Findings

- Differentiation among swamp populations may reflect the geography of SE Asia and the presumed spread of swamp buffalo through this region and the relatively recent spread of water buffalo throughout the region.

SUMMARY

- Genetic relationship of swamp buffaloes in Asia are determined through its evolution
- Differences among swamp populations may be due to geography and domestication

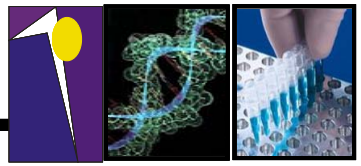
References

Barker JSF, SS Moore, DJS Hetzel,D Evans, SG Tan and K Byrne. 1997. Genetic diversity of Asian water buffalo (*Bubalus bubalis*): microsatellite variation and a comparison with protein coding loci. Animal Genetics 28: 103-115.

Barker JSF, SG Tan, OS Selvaraj and TK Mukherjee. 1997. Genetic variation within and relationships among populations of Asian water buffalo (*Bubalus bubalis*). Animal Genetics: 1-13.

Del Barrio LAM, CB dela Vina, MGN Yebron Jr., CAS Estrella, JRV Herrera and AN del Barrio. 2009. Molecular characterization of the Philippine carabao (*Bubalus bubalis* L.) from the major island groups of the Philippines using molecular cloning and sequence analysis of the D-loop of mitochondrial DNA. Unpublished.

THANK YOU!



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