

**PROPOSAL: NEW SCIENTIFIC NAME OF THE
DOMESTICATED SWAMP BUFFALO,
THE CARABAO – *Bubalus bubalis carabanensis*
[(Sub) Sp. Nov. Castillo 1998]**

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ABSTRACT

The water buffalo (*Bubalus bubalis* L.) may be divided two groups, namely the swamp buffalo, typified by the carabao, and the riverine buffalo, typified by the Murrah. The proposal for a new subspecific name of the swamp buffalo, *Bubalus bubalis carabanensis* [(Sub) Sp. Nov., Castillo, 1998] is suggested because of important differences between the two types. The Carabao has 48 chromosomes while the Murrah has 50. Furthermore, the relative size of chromosome no. 1 in carabao is longer with a metacentric centromere while the Murrah is shorter with a submetacentric centromere.

The carabao is light gray to gray where the Murrah is black to jet black. The carabao stockings from the knees/hocks to the hoofs are whitish in color but are black in Murrah. There are one or more whitish chevron(s) in the ventral side of the neck of the carabao but not in the Murrah. The horns of the carabao are curved upward and inward to form approximately a semicircle (crescent horns) but in the Murrah they are curved or coiled backward and up.

Key words: Carabao – *Bubalus bubalis carabanensis* [(Sub) Sp. Nov., Castillo, 1998] with 48 chromosomes; Murrah – *Bubalus bubalis* (L.) with 50 chromosomes.

INTRODUCTION

In 1966-1967, an extensive review of literature on water buffaloes was done at Cornell University, under a Ford Foundation-Cornell University fellowship for a monograph "From Primitive to Modern Agriculture with Water Buffaloes". In the synthesis of the subject matter on breeding/genetics it was found that the carabao (swamp buffalo) is located mainly in Southeast Asian countries such as Burma, Vietnam, Cambodia, Laos, Malaysia, Thailand, Philippines, Taiwan, Indonesia, Southern China. It is found thriving well in Northern Australia, Micronesia Islands, West Indies, Brazil, and Venezuela. The carabao has morphological and

cytological differences compared to Murrah, hence the suggestion was made by Castillo (1971) to give it another scientific name.

This suggestion caught the attention of Filipino cytologist, Dr. Dolores A. Ramirez and her Ph.D. advisee, Saney Songsri of Thailand. They worked on "The Cytology of Swamp and River Types of Water Buffaloes and Their Hybrids". Their report (1979) supported the proposal for the classification of carabaos as *Bubalus carabanensis* (L.) Castillo, 1971.

In this connection, as early as 1941 MacGregor tried to differentiate the two types of water buffaloes he found in Malaysia. He used swamp type for the carabao and river type for the Indian breed presumably Murrah.

The common name of the swamp buffalo in Indonesia is *karbaw*, in Malaysia *kerbau sawak*, and in Thailand *kwai* (Mason, 1996) and in Philippines *carabao* (or *kabaw* or *kalabaw*. Table 1 shows the buffalo population in some Southeast Asian countries (FAO Production Yearbook, 1997).

Table 1. Buffalo population in some Southeast Asian countries (in 1000 head)

Indonesia	3,140
Laos	1,212
Philippines	2,968
Thailand	4,200
Vietnam	2,954

Presumably, the buffalo referred to is swamp buffalo or carabao as differentiated from the riverine buffalo, the Murrah type.

The carabao population in the Philippines includes about twenty thousand head of purebred Murrah and grade Murrah. The Philippines also imported 2,196 head of purebred Murrah as well as 20,000 doses of Murrah frozen semen in 1995-1998 for breeding purposes (PCC, 1998).

The preceding data indicate that the domesticated swamp buffalo, the carabao used for work, milk, meat, and recreational/ceremonial activities is common in Southeast Asian countries. *Hence, each country serves as a huge Natural History Museum* for inquiring mammalian zoologists or taxonomists, interested scientists, tourists, students or laymen.

As regards taxonomical classification of domesticated Asian buffaloes, the report of Alexiev (1998) is cited as follows: Class Mammalia; Sub-class Ungulata; Order Artiodactyla, Sub-order Ruminantia; Family Bovidae; Sub-family Bovinae; Tribe Bovini. The Tribe Bovini includes three groups: Bovina (cattle), Bubalina (the Asian buffalo); and Syncerina (the African buffalo). The Asian buffalo belongs to the genus *Bubalus*. The species of domestic buffalo is *Bubalus bubalis*.

This proposal suggests that the domesticated swamp buffalo, the carabao, be considered as a new subspecies since there are many anatomical and cytological differences between the swamp buffalo and the riverine buffalo, the Murrah, as presented here. The proposed scientific name is *Bubalus bubalis carabanensis* [(Sub) Sp. Nov., Castillo, 1998] as hinted by Gentry (1998)*.

DISCUSSION

A summary of the anatomical and chromosomal differences between the swamp buffalo (*Bubalus bubalis carabanensis*) and the riverine buffalo (*Bubalus bubalis*) is enumerated in Table 2. The color of the body gives the observer the actual pigmentation for the large majority of swamp buffaloes. However, it is appropriate to mention that a small percentage of the population of carabaos may differ in color. Singleton and Santos (1964) reported that about one percent of the population has an albinoid color. Fischer (1970) confirmed the presence of albinoids in the Philippines, Thailand, and Indonesia. He cited the presence of a larger population in the island of Sumba, Indonesia. The sheath of the penis of the carabao bull is attached close to the abdomen, sometimes giving the impression it does not exist. However, that of the Murrah bull is prominent.

As regards chromosomes of swamp buffalo, Makino (1944) mentioned that he sampled the testes from swamp buffalo bulls of the Kosyun Experimental Farm located at the most southern part of Taiwan (Formosa) in 1940. His report, the first on chromosomes of Southeast Asian swamp buffaloes specified a diploid number of 48. In 1967, Ulbrich and Fischer described the chromosomes of the swamp buffalo in Malaysia and Thailand with a diploid number of 48 while the African buffalo (*Syncerus caffer*) from Kenya had 52 chromosomes. In a subsequent report, Fischer and Ulbrich (1968) mentioned that Murrah buffaloes had 50 chromosomes and the swamp buffaloes of Malaysia had 48. They also stated that it is clearly noticeable that chromosome pair no. 1 of the swamp buffalo is distinctly bigger and metacentric whereas the analogous one of the Murrah is smaller and submetacentric.

The karyotypes of F_1 crossbreds was 49 of which 10 are metacentric and submetacentric, 37 are acrocentric and somatic, and 2 are acrocentric sex chromosomes. The F_1 crossbreds of both sexes appeared to be normal and fertile, both authors suggested further study of F_2 Murrah grades to check on fertility. Later this view was also expressed by Malaysian scientists, Bongso and Hilmi (1982). The findings of the Philippine Carabao Research and Development Center showed that F_1 crossbreds ($2n=49$) were fertile and in interse matings; they produced the F_2 (Parker, 1992).

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Table 2. Summary of anatomical and chromosomal differences between the Carabao (*Bubalus bubalis carabanesis* – swamp buffalo) and Murrah (*Bubalus bubalis* – riverine buffalo)

CRITERIA	CARABAO (swamp buffalo)	MURRAH (riverine buffalo)
Color of body	light gray to gray	black to jet black
Muzzle (front view)	with white hairs	black hairs
Horn shape/form (front view)	approaching semi-circle (crescent horns)	curved backward and up (ram-like type horns)
White stripes (chevrons) on ventral part of neck	one or two present	none
Color of stockings from the knees to the hoofs	white/whitish hair	black hair
Color of stockings from the hocks to the hoffs	white/whitish hair	black hair
Attachment of the penis to the body	relatively close to the abdominal region	loosely hanging sheath, wide, long
Attachment of the scrotal sac of testicles to the body	closer to the body; in between the hind legs	slightly lower and loose; in between the hind legs
Number of chromosomes	48	50
Fundamental number (NF)	58	60
Relative size of chromo- some no. 1	longer	shorter
Relative/approximate location of centromeres	6 metacentric 4 submetacentric 38 acrocentric	4 metacentric 6 submetacentric 40 acrocentric

It is appropriate to mention the work done by Songsri and Ramirez (1979) on the cytology of water buffaloes and their hybrids. The report included the comparison of the Thai and Philippine swamp buffalo, Murrah, F_1 hybrid, and BC (carabao) hybrids. The morphological figures of the karyotypes of male and female carabao and Murrah (Figures 1-4) were clear cut. Furthermore, the classification of the chromosomes (Table 3) indicates the specific number and types of the chromosomes. The study of Majid et al. (1991) corroborated the preceding reports on the basic difference of chromosome number as regards the swamp buffalo and river buffalo and classification of types.

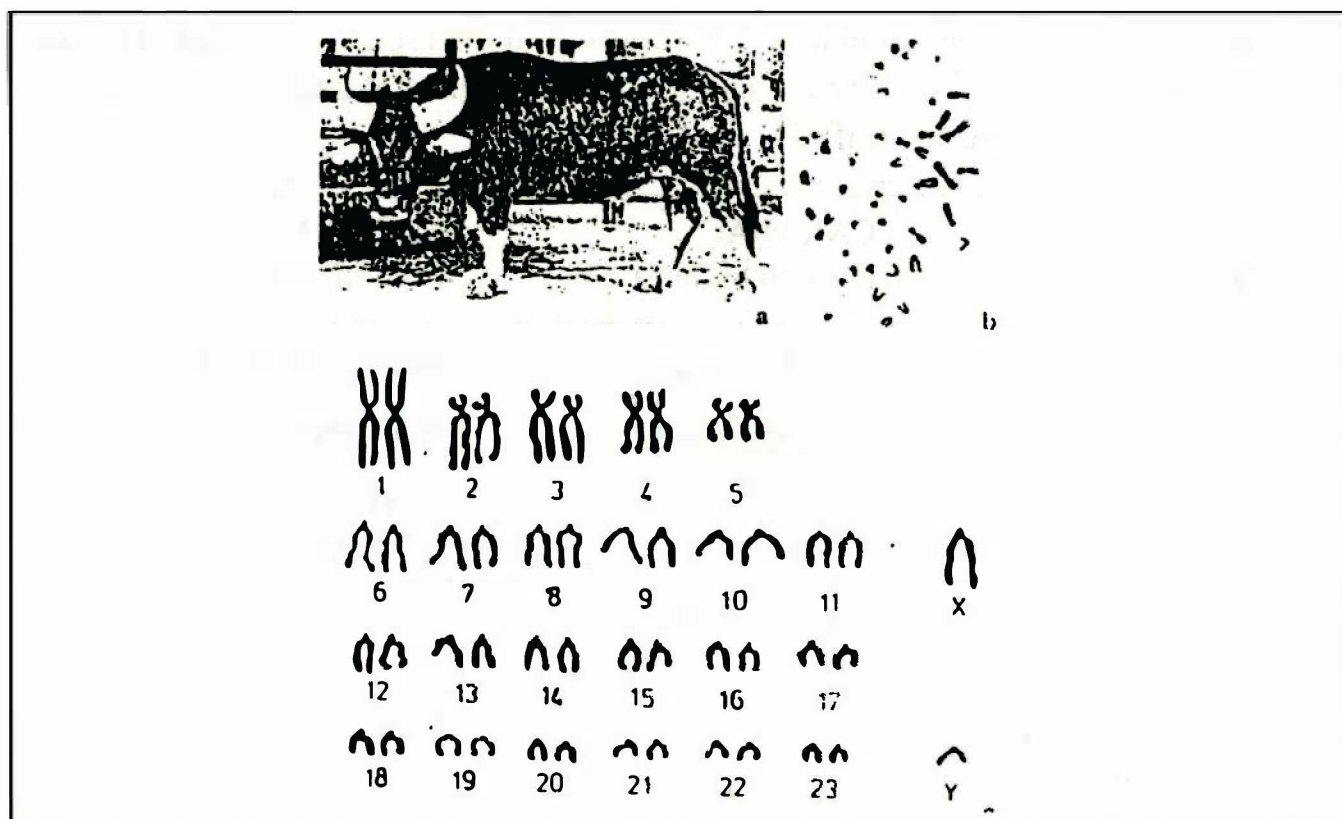


Figure 1. a. Male Philippine carabao; b. mitotic chromosomes of the male Philippine carabao; c. karyotype of the male Philippine carabao (Songsri and Ramirez, 1979).

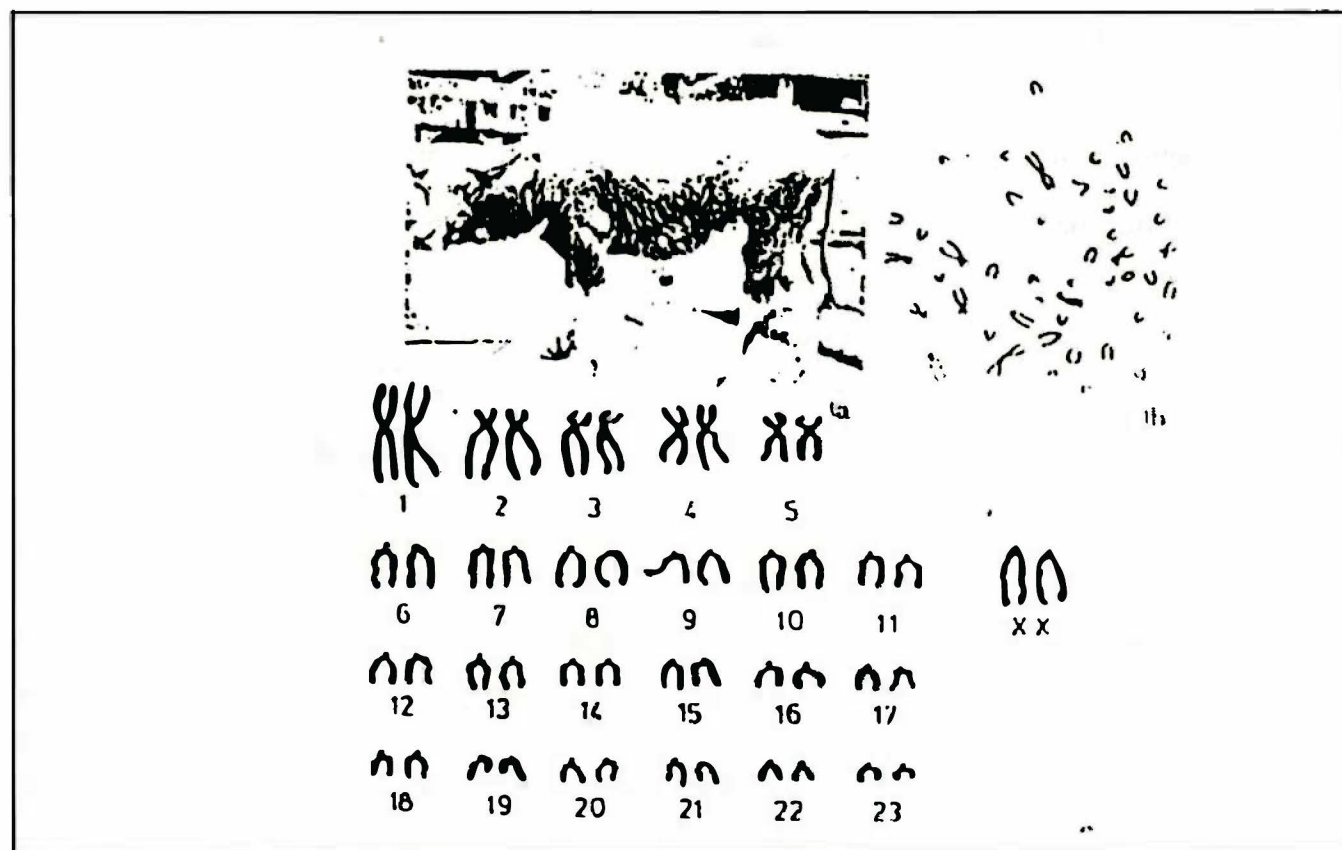


Figure 2. a. Female Philippine carabao; b. mitotic chromosomes of the female Philippine carabao; c. karyotype of the female Philippine carabao (Songsri and Ramirez, 1979).

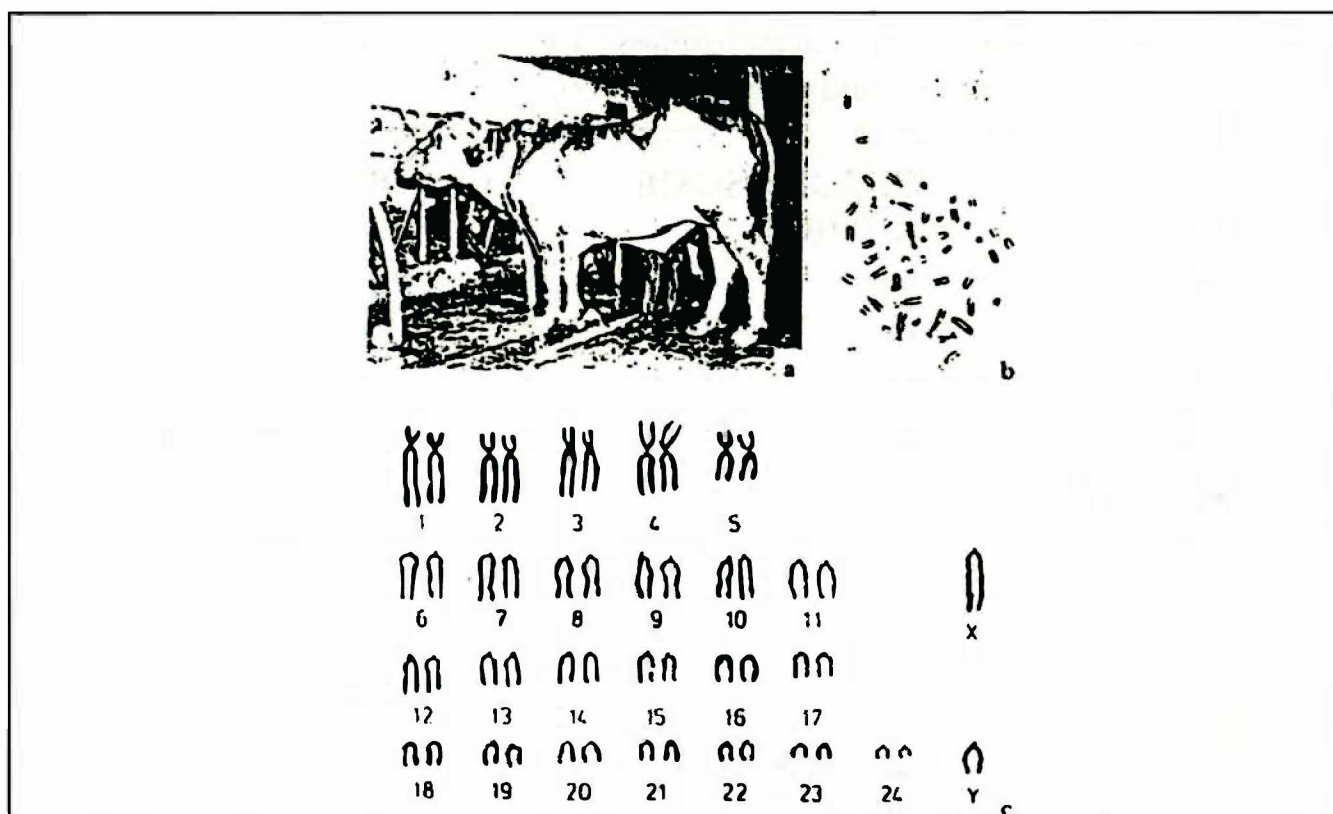


Figure 3. a. Male Murrah buffalo; b. mitotic chromosomes of the male Murrah buffalo; c. karyotype of the male Murrah buffalo (Songsri and Ramirez, 1979).

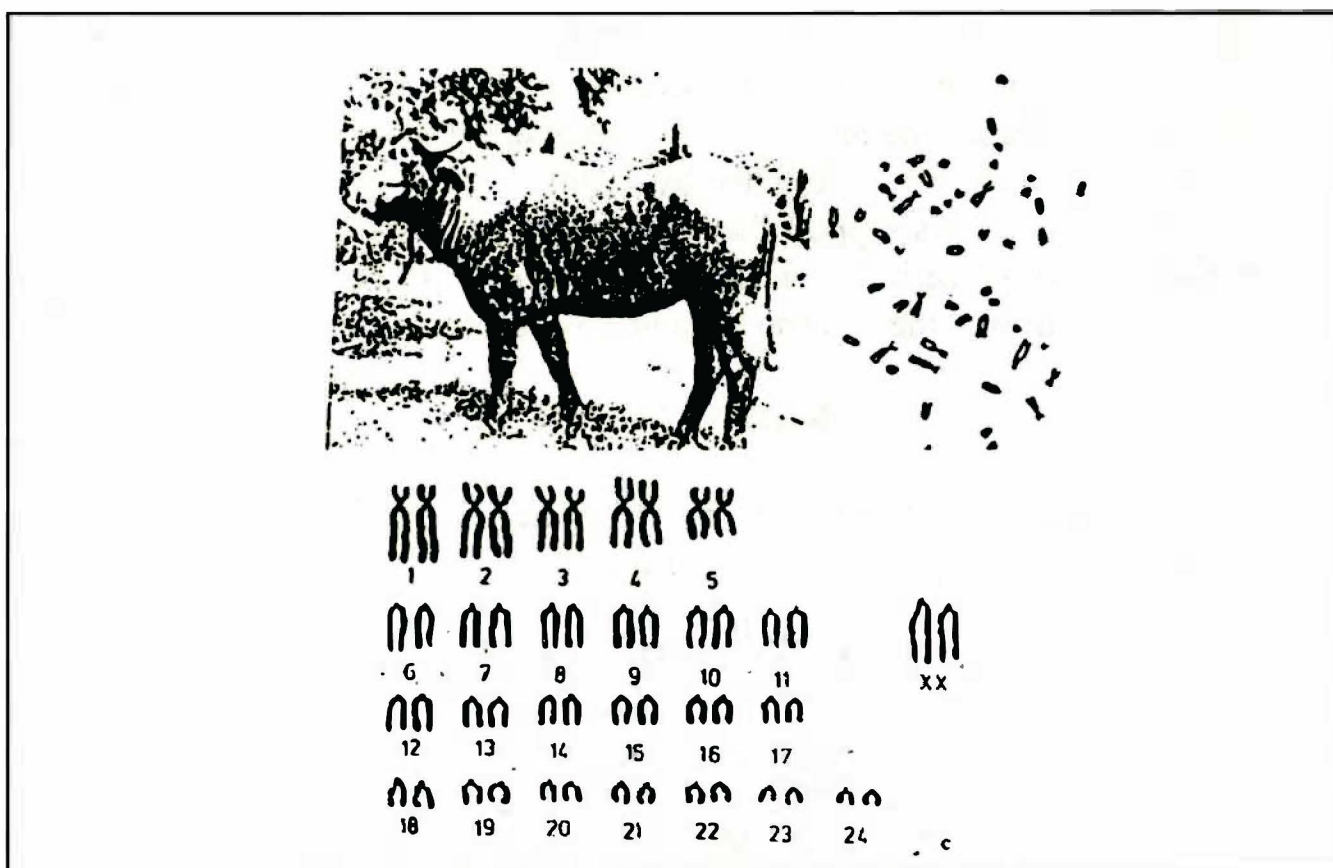


Figure 4. a. Female Murrah buffalo; b. mitotic chromosomes of the female Murrah buffalo; c. karyotype of the female Murrah buffalo (Songsri and Ramirez, 1979).

Table 3. Classification of the chromosomes of the Carabao, Murrah buffalo, F_1 , and BC_1 . (Songsri and Ramirez, 1979).

TYPES OF ANIMALS	CHROMOSOME NUMBER		CHROMOSOME TYPE				
	2n	NF	M	SM	A	A	Y
Thai carabao	48	58	6	4	36	1A	sA
Philippine carabao	48	58	6	4	36	1A	sA
Murrah buffalo	50	60	4	6	38	1A	sA
F_1 - buffalo	49	59	5	5	37	1A	sA
BC_1 (carabao)	49	59	5	5	37	1A	sA

Remarks: NF = Fundamental number; M = Metacentric;
 SM = Submetacentric; A = Acrocentric; l = largest;
 s = small

The existence of a new separate *bubalis* subspecies, the domesticated swamp buffalo in Southeast Asian countries is further supported by the report of Amano, et al. (1984). They estimated the genetic distance among Philippine carabaos, Philippine crossbreds, and Philippine riverine buffalo, Bangladesh buffalo and Indonesia buffalo. From the analyses, they recognized a large genetic difference between swamp and river buffalo (cited by Majid et al., 1994).

The different reports support the suggestion of Castillo (1971, 1983) to give the scientific name of *Bubalus bubalis carabanensis* [(Sub) Sp. Nov., Castillo, 1998] to swamp buffalo, the carabao, as a new subspecies of *Bubalus bubalis* (L.).

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