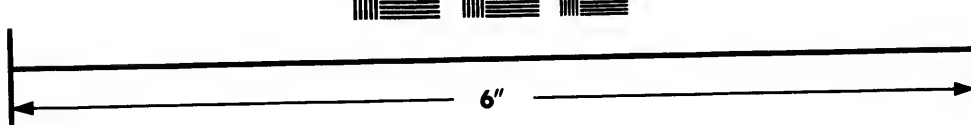
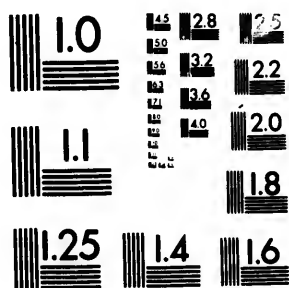


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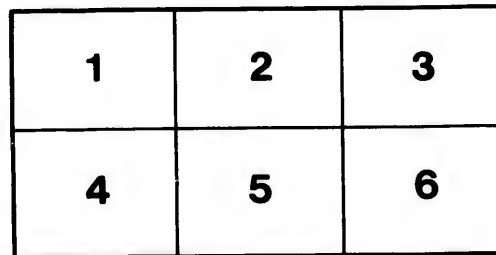
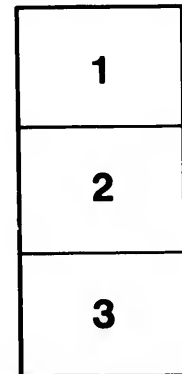
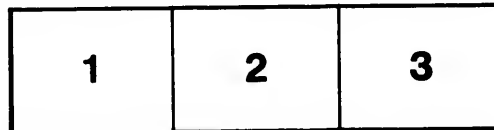
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DECEMBER 28, 1900

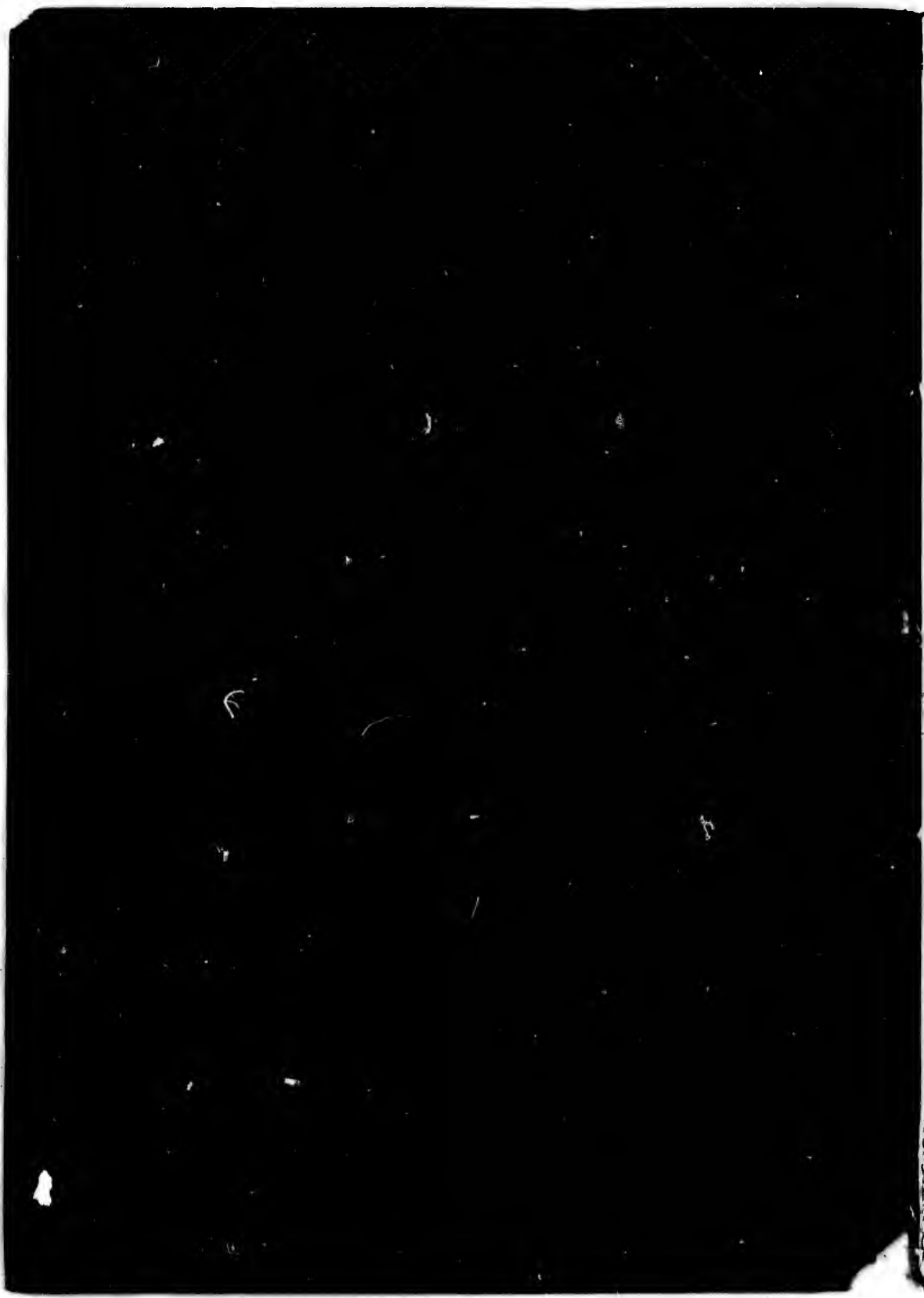
PRELIMINARY REVISION OF THE NORTH
AMERICAN RED FOXES.

[PLATES XXXVI-XXXVII.]

By C. HART MERRIAM.

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PROCEEDINGS
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PRELIMINARY REVISION OF THE NORTH
AMERICAN RED FOXES.

BY C. HART MERRIAM.

[PLATES XXXVI-XXXVII.]

THE specimens necessary for a final revision of the North American Red Foxes do not exist in any museum. Nevertheless the collections of the U. S. Biological Survey and National Museum show that several well-marked forms have escaped description, and furnish material for a preliminary study of the group.

For many years it has been customary to refer all our red foxes, with the single exception of specimens from the far west, to *Vulpes fulvus* Desmarest; and some naturalists have considered this animal the same as *Vulpes vulpes* of northern Europe and Siberia. Outram Bangs, in a paper published in the Proceedings of the Biological Society of Washington in March 1897 (vol. xi, pp. 53-55), stated that the American species is quite distinct from the European and pointed out the characters by which either may be distinguished from the other; at the same time he described a new fox from Nova Scotia, which he named *Vulpes pennsylvanica vafra*.¹ A year later Mr. Bangs described another species, from Newfoundland, which he named *Vulpes delectrix*.²

Baird, in the Report of Stansbury's Expedition to Great Salt Lake, published in May or June 1852, described a cross-fox from Utah under the name *Vulpes macrourus*, to which

¹This name being preoccupied, Mr. Bangs renamed the form *rubricosa*. Science, NS., VII, pp. 271-272, Feb. 25, 1898.

²Proc. Biol. Soc. Wash., XII, pp. 36-38, March 24, 1898.

specimens from all parts of the far west have been usually referred. Additional specimens from the type locality are not at hand; hence I have been obliged to characterize the species from specimens collected in other parts of the Rocky Mountains—from Colorado and Wyoming. Comparison of the scanty material available from the Rocky Mountain region with corresponding specimens from the Great Plains, the Cascade Range in Oregon and Washington, and the High Sierra in California, has led me to recognize as distinct three additional species, heretofore confounded under *macrourus*.

Of the Alaska red foxes little is known and only one species has been described—the large Kadiak Island species, *Vulpes harrimani*, recently published by me in these Proceedings.¹ Two others from Alaska, one from British Columbia, and one from Labrador are here added to our fauna.

Mr. Bangs has kindly loaned me his types and other specimens from Labrador, Newfoundland, and Nova Scotia, thus enabling me to compare these forms directly with those from Alaska and the northern United States. Good skins with skulls are still needed from various parts of Alaska, the Rocky Mountain region, and the southern United States.

As a result of the present study, twelve species and subspecies are recognized. These, with their type localities, are:

<i>Vulpes fulvus</i> Desmarest	Virginia.
<i>macrourus</i> Baird	Wasatch Mountains, Utah.
<i>necator</i> sp. nov.	Southern High Sierra, Calif.
<i>cascadensis</i> sp. nov.	Mt. Adams, Washington.
<i>rubricosa</i> Bangs	Nova Scotia.
<i>rubricosa bangsi</i> subsp. nov.	Labrador.
<i>deletrix</i> Bangs	Newfoundland.
<i>alascensis</i> sp. nov.	Lower Yukon, Alaska.
<i>alascensis abietorum</i> subsp. nov.	Stuart Lake, British Columbia.
<i>kenaiensis</i> sp. nov.	Kenai Peninsula, Alaska.
<i>harrimani</i> Merriam	Kadiak Island, Alaska.
<i>regalis</i> sp. nov.	Elk River, Minn.

Of these, the last three (*regalis*, *harrimani*, and *kenaiensis*) are very large—probably double the bulk of the common eastern red fox; *abietorum* is only slightly smaller; *alascensis* is still slightly smaller and hardly larger than *deletrix*, *rubricosa*,

¹Proc. Wash. Acad. Sci., II, pp. 14-15, March 14, 1900.

and *bangsi*; then comes *macrourus*, and finally the smallest members of the group, *cascadensis*, *necator*, and *fulvus*.

In the large species (*regalis*, *harrimani*, and *kenaiensis*) the males are enormously larger than the females; in the smaller species the sexual disparity in size is much less pronounced.

VULPES FULVUS (Desmarest).

Pl. XXXVII, fig. 1.

Canis fulvus DESMAREST, Mammalogie, 1, pp. 203-204, 1820.

Type locality.—Virginia.

Range.—Northeastern United States.

Characters.—Size small; face small and sharp; tail terete and rather small; black of fore and hind feet extensive and reaching far up on legs.

Color.—Face rusty fulvous, profusely grizzled with whitish; upper parts bright golden fulvous, varying to fulvous, darkest along middle of back; hinder part of back slightly grizzled with whitish; chin, throat, and band down belly white; black of forefeet spreading over whole foot and reaching up broadly to elbow; black of hind feet reaching up in narrow band along outer side of thigh. Tail fulvous, profusely mixed with black hairs which are most abundant on distal half of under surface; a black spot near base of upper surface; tip white.

Compared with *Vulpes vulpes* of Sweden, *V. fulvus* is smaller; tail shorter and smaller; rusty of face paler and very much more profusely mixed with whitish [in *vulpes* the rusty is nearly pure]; black of fore and hind feet very much more extensive. In cranial characters the two are quite distinct, as shown under *V. alascensis*.

Skull.—Small; face and rostrum small and slender; bullæ smaller than in any other American species and sloping gradually (instead of rising abruptly) from basioccipital; basioccipital broad.

Teeth.—Rather small; premolars well spaced; upper carnassial with anterointernal cusp moderately developed but not projecting strongly from plane of inner side of tooth; 1st upper molar smaller than in any described species.

Measurements.—Average of 3 males from southern New England: total length 1034; tail vertebræ 394; hind foot 163.

VULPES MACROURUS Baird.

Pl. XXXVI, fig. 1.

Vulpes macrourus BAIRD, Rept. Stansbury's Expd. to Great Salt Lake, pp. 309-310, June 1852; Mammals N. Am., pp. 130-133, 1857.

Vulpes utah AUDUBON & BACHMAN, Proc. Acad. Nat. Sci. Phila., p. 114, July 1852.

Type locality.—[Wasatch Mts. bordering] Salt Lake Valley, Utah.

Range.—Mountains of Colorado, Utah, and Wyoming.

Characters.—Size and general appearance of *fulvus*, but *tail much longer*; hind feet larger; black of feet and legs much less extensive.

Color.¹—Nose dull brownish fulvous, grizzled with buffy; sides of face between nose and eyes dusky, grizzled with whitish; rest of face mixed buffy or buffy fulvous and whitish; back yellowish fulvous, darkest on median line, palest on sides of neck and flanks; outer sides of legs dark reddish fulvous; black of forefeet reaching up narrowly nearly to elbow; black of hind feet narrow and hardly reaching ankle. Tail grizzled grayish buff mixed with black hairs, the black hairs on upper side of base forming a broad blackish patch. Chin dusky; whitish of throat and breast darkened by underfur showing through.

Skull.—Similar to that of *fulvus*, but *bullæ much larger* and rising abruptly from basioccipital; basioccipital narrower; carnassials slightly larger; 1st upper molar decidedly larger.

Measurements.—A young ♂ from Wind River Mts., Wyoming: total length 1015; tail vertebræ 461; hind foot 172.

VULPES NECATOR sp. nov. High Sierra Fox.

Pl. XXXVI, fig. 2.

Type from Whitney Meadows near Mt. Whitney, High Sierra, Calif. (Altitude 9500 ft.) No. ~~40714~~ 40714, ♀ yg. ad., U. S. National Museum, Biological Survey Coll. Sept. 1, 1891, A. K. Fisher. Orig. no. 940.

Range.—Southern or High Sierra, California.

Characters.—A small fox of the *fulvus* group, resembling *fulvus* externally, but cranially most closely related to *macrourus*. Tail small as in *fulvus* (or smaller), differing widely from the big tail of *macrourus*.

Color.—Face dull fulvous, strongly grizzled with whitish; sides of nose dusky, grizzled with buffy; upperparts from back of head to base of tail dark dull rusty fulvous, becoming much paler on sides, where the whitish underfur shows through; black of forefeet reaching up on upper surface of foreleg to elbow; black of hind feet ending at or near tarsal joint, with only slight traces on outer side of leg; tail at base fulvous, becoming buffy whitish and profusely mixed with long black hairs; base with the usual black spot; tip white.

A male from Atwell's Mill, East Fork Kaweah River, Tulare Co., California (alt. 6300 ft.), collected the last of March, is in the black-

¹From a male from Wind River Mts., Wyoming, August 28, 1893.

cross pelage: back grizzled black and whitish or buffy; sides buffy; feet, legs, and belly black; tail mainly black with tip white.

Skull.—Compared with *cascadensis*, its nearest geographical neighbor, the rostrum is more slender, the bullæ smaller, and in adult males the zygomata much more spreading. The carnassials both above and below are slightly larger and more swollen; the 1st and 2d upper molars and 2d lower molar are *decidedly larger*. Briefly, the rostrum is more delicate and slender, the molars (except the 3d lower) larger and heavier. The heel of the 2d upper molar is broader and less emarginate posteriorly. Compared with *macrourus* from the Rocky Mts., the resemblance is closer and the differences less marked: the rostrum is slightly narrower and more constricted laterally; the bullæ slightly smaller; the upper molars slightly larger (heel broader); 3d lower molar decidedly smaller.

Remarks.—Externally the High Sierra Fox in red pelage resembles the common red fox of the eastern United States (*fulvus*) much more closely than it does either *cascadensis* or *macrourus*. It differs from *fulvus* however in having the sides of the nose much darker (distinctly dusky); black of legs much restricted; fulvous of back duller and redder; ground color of tail buffy instead of fulvous.

Vulpes necator is apparently more closely related to its Rocky Mountain ally (*macrourus*), now separated by the full breadth of the Great Basin, than to its immediate neighbor of the northern Sierra (*cascadensis*) whose range it doubtless meets, as *cascadensis* has been found as far south as Mt. Raymond in Mariposa County, Calif.

Measurements.—Type specimen (♀): total length 930; tail vertebræ 345; hind foot 150. A ♂ from Atwell's Mill, on the west flank of the Sierra, measured: total length 1003; tail vertebræ 381; hind foot 171.

VULPES CASCADENSIS sp. nov.

Pl. XXXVI, fig. 3.

Type from Trout Lake, base of Mt. Adams, Cascade Range (near Columbia River), Washington. No. 92767, ♂ yg. ad., U. S. National Museum, Biological Survey Coll. March 3, 1898, P. Schmid. (Black-cross phase.)

Range.—Cascade Range in Oregon and Washington, and northern Sierra Nevada in California; northern limit unknown.

Characters.—A short-tailed, small-toothed mountain fox of the *fulvus* group, commonest in the 'black-cross' pelage; when in red pelage, *yellow* instead of fulvous (like a small edition of *regalis*). In

cranial and dental characters very close to *fulvus*; not very close to *macrourus*.

Color.—*Red phase*: General color of head and upperparts straw yellow; face from nose to eyes dull yellowish fulvous; rest of top of head and base of ears pale straw yellow; back golden yellowish-fulvous; tail very pale; black of ears and feet greatly restricted, that of fore and hind feet confined rather narrowly to upper surface, and mixed with pale fulvous.

Black-cross phase: Top of nose grizzled brownish, sides of nose and imperfect ring around eye dusky or blackish, grizzled with whitish; top of head yellowish white, the black underfur showing through; dorsal cross (back and shoulders) blackish, overlaid and nearly concealed by yellowish white or buffy; sides of neck, flanks, and post-scapular region golden yellow; distal two-thirds of ear black; fore-feet black, grizzled above elbow with whitish and yellowish; hind feet and legs grizzled dusky and buffy, becoming nearly black on top of feet; chin, throat, and band down middle of belly black or blackish; inner sides of thighs washed with dusky. Tail black mixed with buffy and tipped with white [in some specimens nearly all black to white tip]. Specimens from Mt. Hood and Ft. Klamath, Oregon, are practically identical with those from Trout Lake, State of Washington.

Skull.—Similar to that of *fulvus* but bullæ larger; 1st upper molar (and usually upper carnassial) slightly larger. Compared with *macrourus* the carnassials, 1st upper molar (and usually the 2d also), and 2d lower molar are smaller. The premolars also are usually smaller, particularly the lower series.

Measurements.—Average of three males from Mt. Adams, Washington: total length 1070; tail vertebra 412; hind foot 178.

VULPES RUBRICOSA Bangs. Nova Scotia Fox.

Pl. XXXVII, fig. 3.

Vulpes pennsylvanica vafra BANGS, Proc. Biol. Soc. Washington, vol. XI, pp. 53-55, March 16, 1897 (name preoccupied).

Vulpes pennsylvanica rubricosa BANGS, Science, NS., VII, 271-272, Feb. 25, 1898.

Type locality.—Digby, Nova Scotia.

Range.—Nova Scotia—limits unknown.

Characters.—Size rather large; color deepest and darkest of all the red foxes; tail large, very broad and bushy, and deep fulvous. Rostrum and teeth larger than in *fulvus*.

Color.—Upperparts deep rich and very dark fulvous; black of fore and hind feet reaching up a short distance on legs, but less extensive

than in *fulvus*; tail rich dark fulvous, with basal ring like back; rest of tail, except white tip, bountifully mixed with black hairs, most abundant below.

Skull.—Size essentially the same as *fulvus* of corresponding sex; similar to *fulvus* in general characters, but rostrum slightly more swollen; teeth larger. Premolars larger, more swollen, and less spaced; carnassials larger; 1st upper molar larger.

Measurements.—Type specimen (♀ old): total length 1077; tail vertebræ 401; hind foot 166 (from Bangs).

VULPES RUBRICOSA BANGSI subsp. nov.

Type from Lance au Loup, Labrador. No. 8880, ♀ (young of year), Bangs Coll. Oct. 2, 1899, Ernest Doane.

Range.—Labrador—limits unknown.

Characters.—Similar externally to *fulvus* but ears smaller; black of ears and feet more restricted. Skull as in *rubricosa* and *deletrix*.

Color.—Upperparts golden fulvous, as in *fulvus*; tail bountifully mixed with black hairs, as in *fulvus* and allied forms; black of ears restricted to apical half or less; black of fore and hind feet not reaching up on legs.

Skull.—Very close to *rubricosa*, from which it differs chiefly in greater narrowness, particularly of the zygomata and posterior part of palate, and in slightly larger teeth. The differences, however, do not appear to be constant or reliable—see remarks under *deletrix*.

Measurements.—(♂, not full grown, measured in flesh by collector): total length 964; tail vertebræ 378; hind foot 168; ear from notch 88.

VULPES DELETRIX Bangs.

Pl. XXXVII, fig. 2.

Vulpes deletrix BANGS, Proc. Biol. Soc. Washington, Vol. XII, pp. 36-38, Mar. 24, 1898.

Type locality.—Bay St. George, Newfoundland.

Range.—Newfoundland.

Characters.—Color very pale—light straw yellow, deepening in places to golden yellow or even buffy fulvous; black of feet restricted; tail pale buffy yellowish with usual admixture of black hairs, but without black basal spot. Hind feet and claws very large (about 160 in ♀).

Skull.—Very close to that of *rubricosa* but averaging narrower; zygomata less spreading in male; bullæ usually larger; teeth usually more swollen. Still, the resemblance is exceedingly close and I have been unable to find any positive character by which skulls of New-

foundland, Labrador, and Nova Scotia foxes may be certainly distinguished. Collectively they all differ from *fulvus* in slightly broader rostrum and decidedly larger teeth, as pointed out under *rubricosa*.

Measurements.—Type specimen (♀): total length 959; tail vertebrae 336; hind foot 161 (from Bangs).

VULPES ALASCENSIS sp. nov.

Type from Andreafski, Alaska. No. 21420 [old ♂], U. S. National Museum. Feb., 1880, E. W. Nelson. Orig. No. 180.

Range.—Northern Alaska—limits unknown.

Characters.—A large long-tailed red fox closely related to *V. vulpes* of Scandinavia and Siberia, and also to *rubricosa* and *bangsi* of Nova Scotia and Labrador. Color golden fulvous; tail very long; ears small; black of feet greatly restricted; pelage of neck and anterior part of back long and full, almost forming a ruff; pelage of posterior part of back and rump shorter and coarser.

Color.—Face and head grizzled fulvous and buffy, strongly rusty on top of nose and around eyes, paler on cheeks and forehead; upperparts fulvous or golden fulvous, much like Massachusetts specimens of *V. fulvus* but color deeper, particularly on top of neck and along dorsal line of back; rump and hind back grizzled; black of feet greatly restricted, that of forefeet not covering whole top of foot and not reaching above carpus; that of hind feet confined to median part of upper surface, spreading slightly over base of toes. Tail very long and bushy, fulvous like back, with the usual admixture of black hairs.

Skull.—Broad and relatively short, with broadly spreading zygomata, short and rather narrow rostrum (strongly constricted laterally on plane of 2d or between 2d and 3d premolars), and short upturned nose. Compared with its nearest geographical neighbors, *harrimani* and *kenaiensis*, the posterior part of the skull is much the same, while the anterior or facial part is greatly reduced (the rostrum being smaller, narrower, more constricted laterally), the nose more upturned, and the carnassial and molar tooth smaller. Compared with *kenaiensis* the carnassials, 1st upper molar, and 2d lower molar are decidedly smaller. Compared with *harrimani* the carnassials and molars are smaller and the anterointernal cusp of the upper carnassial is more anterior and less protruding laterally. Closely related to *rubricosa* and *bangsi*, with which it may intergrade; resembles *rubricosa* closely in size and proportions, but differs in having the rostrum slightly broader and more constricted laterally, the bullae slightly larger (usually), the upper lateral series of teeth heavier [lower series essentially as in *rubricosa*].

Remarks.—The Alaska red fox is evidently a large form of the small narrow-faced *fulvus* group, to which *rubricosa* belongs. It differs widely from the large-faced group to which *harrimani*, *kenaiensis*, and *regalis* belong. It is closely related to the typical Old World *Vulpes vulpes* of Sweden and northern Siberia, and appears to serve as a connecting link between this species and the small-faced *fulvus* group of eastern North America. It may be distinguished from *vulpes*, with which it agrees in size, by the following characters: rostrum more swollen immediately in front of orbits, more constricted laterally, shorter and more upturned anteriorly; bullæ larger; basioccipital narrower; zygomata broader and more spreading; postorbital constriction less deep; incisive foramina shorter; anterointernal cusp of upper carnassial more prominent and forming a more decided angle with body of tooth; crowns of upper premolars usually longer anteroposteriorly. Compared with *V. abietorum* from Stuart Lake and Whitemud, the rostrum is *much shorter* and slightly broader; bullæ slightly smaller; upper carnassial (and usually lower also) more swollen. Compared with *V. fulvus* from the eastern United States, *alascensis* is larger; the fur of the neck and fore-back is longer and fuller, forming a sort of ruff; the tail very much longer and larger; ears smaller; face redder or more rusty, especially around eyes and over bridge of nose; black of feet greatly reduced, as already described.

VULPES ALASCENSIS ABIETORUM subsp. nov.

Type from Stuart Lake, British Columbia. Skull No. 71197 ♂ ad., U. S. National Museum, Biological Survey Coll. Winter of 1893-1894, A. C. Murray. 'Silver fox.'

Range.—Interior of British Columbia and probably southeastern Alaska.

Characters.—External characters unknown. The skull is generally like that of *alascensis* but lighter, longer, and more slender. Skulls of adult males resemble those of *V. regalis* but may be distinguished by the much smaller teeth.

Skull.—Similar to *alascensis* but longer, more slender, and less massive; rostrum decidedly longer and narrower; bullæ usually larger; carnassials (particularly the upper ones), and usually the 1st upper molars also, more slender. Compared with *V. regalis*, with which the males agree closely in length, the posterior part of the skull is longer, the rostrum even more slender, and the sexual differences less marked; compared with skulls of the same sex of *regalis*, the males have smaller bullæ and decidedly smaller carnassials and molars;

the females slightly longer skulls and slightly smaller lower carnassials. Compared with *bangsi* from Labrador, the rostrum is decidedly longer, the carnassials and large upper molar smaller and less swollen.

VULPES KENAIENSIS sp. nov.

Pl. XXXVI, fig. 5.

Type from Kenai Peninsula, Alaska. No. 96145, ♂ old, U. S. National Museum, Biological Survey Coll. Collected in 1898 by Dall DeWeese.

Range.—Kenai Peninsula; limits of range unknown.

Characters.—Size large; external characters unknown; rostrum long and much more slender than in *harrimani*, but broader than in *regalis*. Skin not seen; pelage said to be softer and more valuable than the neighboring Kadiak animal (*harrimani*), which has very coarse fur.

Skull.—Largest of the known species; facial part large and long; muzzle very broad. Similar in general to *harrimani* but rostrum decidedly longer, less swollen over canines, lateral constriction absent, and nose less upturned; zygomata more spreading posteriorly; frontal broader interorbitally; premolars more spaced; upper carnassial and 1st upper molar huge; upper carnassial with anterointernal cusp weaker and set more anteriorly (not projecting so far into palate); 1st upper molar larger; 2d lower molar larger and more bellied on inner side; last lower molar often absent. *V. kenaiensis* resembles *regalis* from the northern plains in length of rostrum, breadth of zygomata, and large size and proportions of carnassial and molar teeth, but differs in having the rostrum less slender, zygomata more spreading posteriorly, and premolars very much larger and more swollen—in this respect even exceeding those of *harrimani*. Hence, while in some particulars the species is intermediate between *harrimani* and *regalis*, in others it departs materially from both.

Cranial measurements.—Type specimen (♂ ad): basal length 148; basilar length 145; palatal length 79; postpalatal length 68.5; zygomatic breadth 82.5; interorbital breadth 30.5; least breadth of rostrum on plane of 2d premolar (constriction absent) 27; length of crown of pm⁴ on outer side 15.5; length of m¹ on outer side 11; length of heel (transversely) from notch on outer side 13.

VULPES HARRIMANI Merriam.

Pl. XXXVI, fig. 6.

Vulpes harrimani MERRIAM, Proc. Wash. Acad. Sci., vol. 11, pp. 14–15, March 14, 1900.

Type locality.—Kadiak Island, Alaska.

Range.—Kadiak Island, Alaska.

Characters.—Size large; tail enormous, constricted at base, largest on basal fourth and tapering thence to tip; pelage coarse, wolf-like on tail and posterior half of back; hairs of neck and shoulders greatly elongated, forming a conspicuous ruff; those of posterior half of back abruptly much shorter and conspicuously grizzled.

Color.—Nose to between eyes pale dull fulvous, grizzled with whitish; top of head from between eyes to nape buffy whitish, grizzled with yellowish fulvous; anterior half of back bright yellowish fulvous, the color extending down over sides and belly nearly to median line; posterior half of back coarsely grizzled buffy-whitish and dull fulvous, reddest along median line; underparts yellowish-fulvous except chin, throat, inguinal region, and a narrower strip on belly, which parts are grayish-buffy; ears black; fore and hind legs and feet dull pale fulvous, with an irregular black patch on dorsal surface of fore-foot, and a much smaller one on hind foot; tail grizzled grayish and yellowish fulvous, the fulvous most marked on median line of upper surface, the black-tipped hairs less abundant than in related species but sufficiently plentiful on basal fourth of dorsal surface to form an indistinct black patch or spot; tip inconspicuously white or buffy white.

Skull.—Large and massive with large, broad, and relatively short rostrum, conspicuously swollen over roots of canines; premolars large and crowded. Closely related to *V. kenaiensis* from which it differs as follows: rostrum shorter, much broader and more swollen over canines; nose more upturned; frontals narrower; frontal sulcus deeper; zygomata less spreading; upper carnassial usually heavier with anterointernal cusp more strongly developed and set out at greater angle from axis of tooth; 1st upper and 2d lower molar smaller. (These tooth characters are probably not constant.)

Compared with *regalis*, with which it agrees in general size, the rostrum and palate are broad and short [instead of long and slender], zygomata less spreading; upper carnassial thicker and heavier with anterointernal cusp strongly developed and projecting at right angle into palate; lower carnassial more swollen (broader, but shorter anteroposteriorly); 2d lower molar smaller, narrower, and more rectangular (less convex or bellied on inner side.)

Measurements.—Type specimen [a dry skin]: total length 1260; tail vertebræ [approximate] 450; tail to end of hairs 550; greatest diameter of tail, hairs laid naturally, 160; greatest diameter of tail, hairs spread, 250.

Cranial measurements.—Skull no. 98144, from Uyak Bay, Kadiak

Island: basal length 140; zygomatic breadth 77; palatal length 74.5; postpalatal length 65; breadth across postorbital processes 33; interorbital breadth 27.5; postorbital constriction 22.5; greatest breadth of rostrum over roots of canines 26.3; lateral series of teeth (from front of canine to back of last molar) 66.

VULPES REGALIS sp. nov. Northern Plains Fox.

Pl. XXXVI, fig. 4.

Type from Elk River, Sherburn Co., Minnesota. No. ~~41887~~⁴¹⁸⁸⁷, ♂ ad., U. S. National Museum, Biological Survey Coll. March 5, 1887, Vernon Bailey. Orig. No. 659.

Range.—Northern Plains from Dakota to Alberta; east to Manitoba and Minnesota; limits unknown.

Characters.—Size largest; ears very large and broad; tail very long but diameter less than in *rubricosa*; sexual difference in size great; color a beautiful golden yellow, becoming almost buffy-white on face and posterior part of back; legs abruptly dark fulvous; black of feet very pure but restricted in area.

Color.—Face, top of head, and base of ears pale straw yellow becoming pale fulvous around eyes; a darker area on each side of nose, reaching from whiskers nearly to eye; upperparts golden yellow or pale yellowish fulvous, becoming almost buffy-white posteriorly and grizzled on hinder part of back; fore and hind legs abruptly red or rusty fulvous, in striking contrast with yellow of body; forefeet intensely black, the black reaching up on front face of leg, narrowly, to halfway between wrist and elbow; hind feet intensely black on upper surface, the black narrowing posteriorly and ending at or near ankle; dark fulvous of outer side of thigh sometimes narrowly mixed with grizzled black and whitish. Tail with basal ring like back, without black hairs; rest of tail to white tip buffy, strongly intermixed with long black hairs, especially on underside.

Skull.—Skull large, long, and relatively massive, with long slender rostrum, broadly spreading zygomata, large inflated bullæ, and narrow slender premolars. Compared with *V. kenaiensis*, its nearest ally, it may be distinguished by more slender rostrum, and very much narrower and more spaced premolars. From *harrimani* it differs in slightly greater length; much longer and narrower rostrum and palate; more spreading zygomata; larger and more inflated bullæ; less prominent frontonasal sulcus; narrower and more spaced premolars; narrower upper carnassial, with anterointernal cusp weaker and less projecting over palate; upper molars decidedly larger; lower carnassial

more slender; 2d lower molar broader and more bellied on inner side.

On account of the great disparity in size, skulls of *V. regalis* require no comparison with those of the same sex of the *fulvus* group; but females of *regalis* agree so closely in size with males of *fulvus* that care is necessary to distinguish them. *V. regalis* may be known by the size of the bullæ, which are larger, and the form of the postglenoid process, which is much broader at base, shorter, and less vertical.

Measurements.—Type specimen (♂ ad.): total length, in flesh, 1117; tail vertebræ from well made dry skin 420; hind foot in dry skin 170; ear from anterior base in dry skin 98. An adult ♀ from Carberry, Manitoba, measured in flesh: total length 1050; tail 392; hind foot (dry) 157.

PLATE XXXVI.

Carnassial and molar teeth of Red Foxes. All natural size.

- FIG. 1. *Vulpes macrourus*, ♂. Arkins, Colo., Nov. 29, 1894. No. 69982, U. S. Nat. Mus., Biological Survey Coll.
2. *Vulpes nicator*, ♂. Mt. Whitney, Calif., July 5, 1891. No. 41197, U. S. Nat. Mus., Biological Survey Coll.
3. *Vulpes cascadenis*, ♂. Trout Lake, Mt. Adams, State of Washington, Feb. 12, 1897. No. 82041, U. S. Nat. Mus., Biological Survey Coll.
4. *Vulpes regalis*, ♂. Elk River, Minn., March 5, 1887. No. 43558, U. S. Nat. Mus., Biological Survey Coll.
5. *Vulpes kenaiensis*, ♂. Kenai Peninsula, Alaska, 1898. No. 96145, U. S. Nat. Mus., Biological Survey Coll.
6. *Vulpes harrimani*, ♂. Uyak Bay, Kadiak Island, 1899. No. 98144, U. S. Nat. Mus., Biological Survey Coll.



TEETH OF RED FOXES

size.

No. 69982, U. S.

No. 41197, U. S.

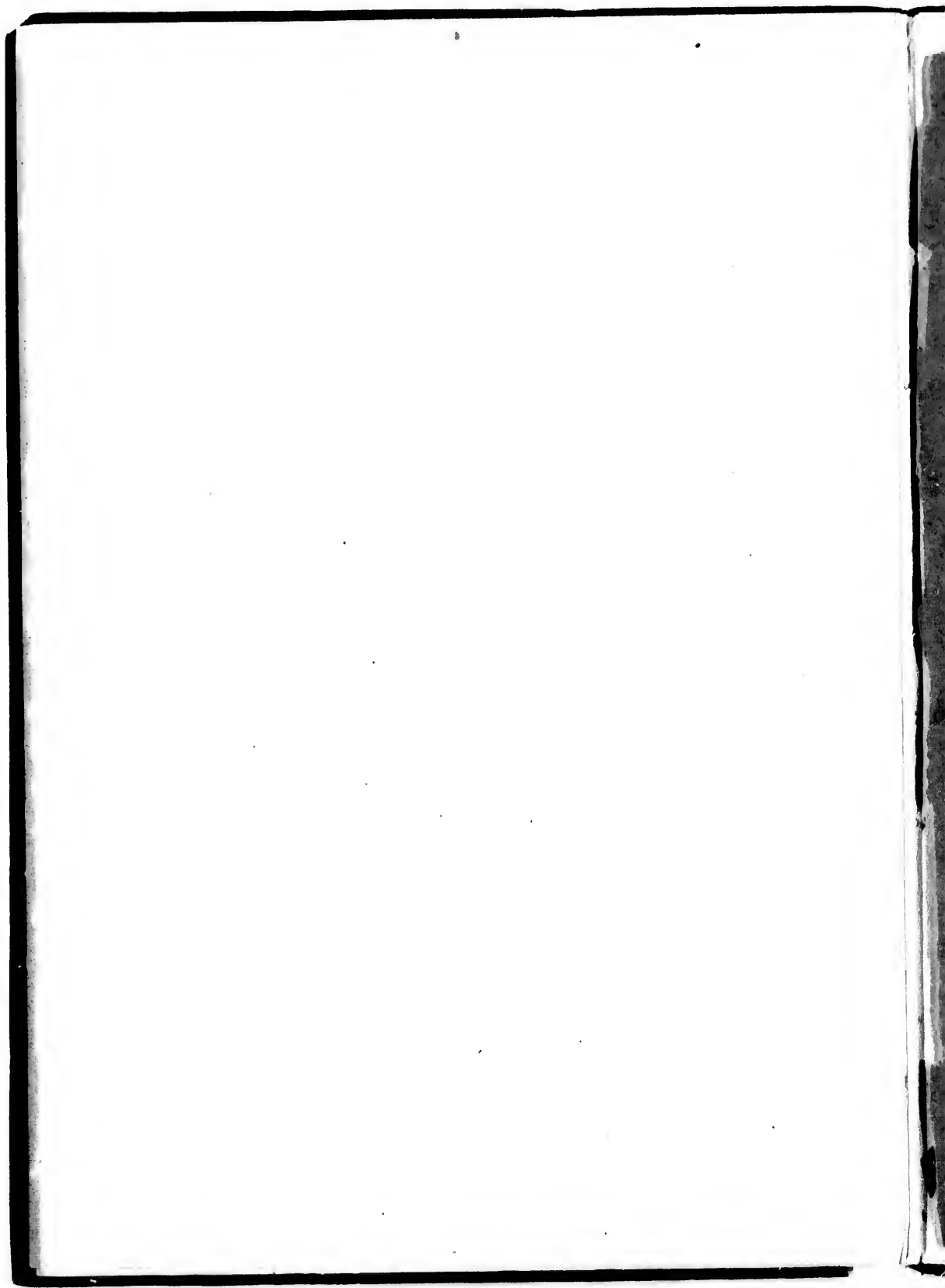
Washington,
Survey Coll.

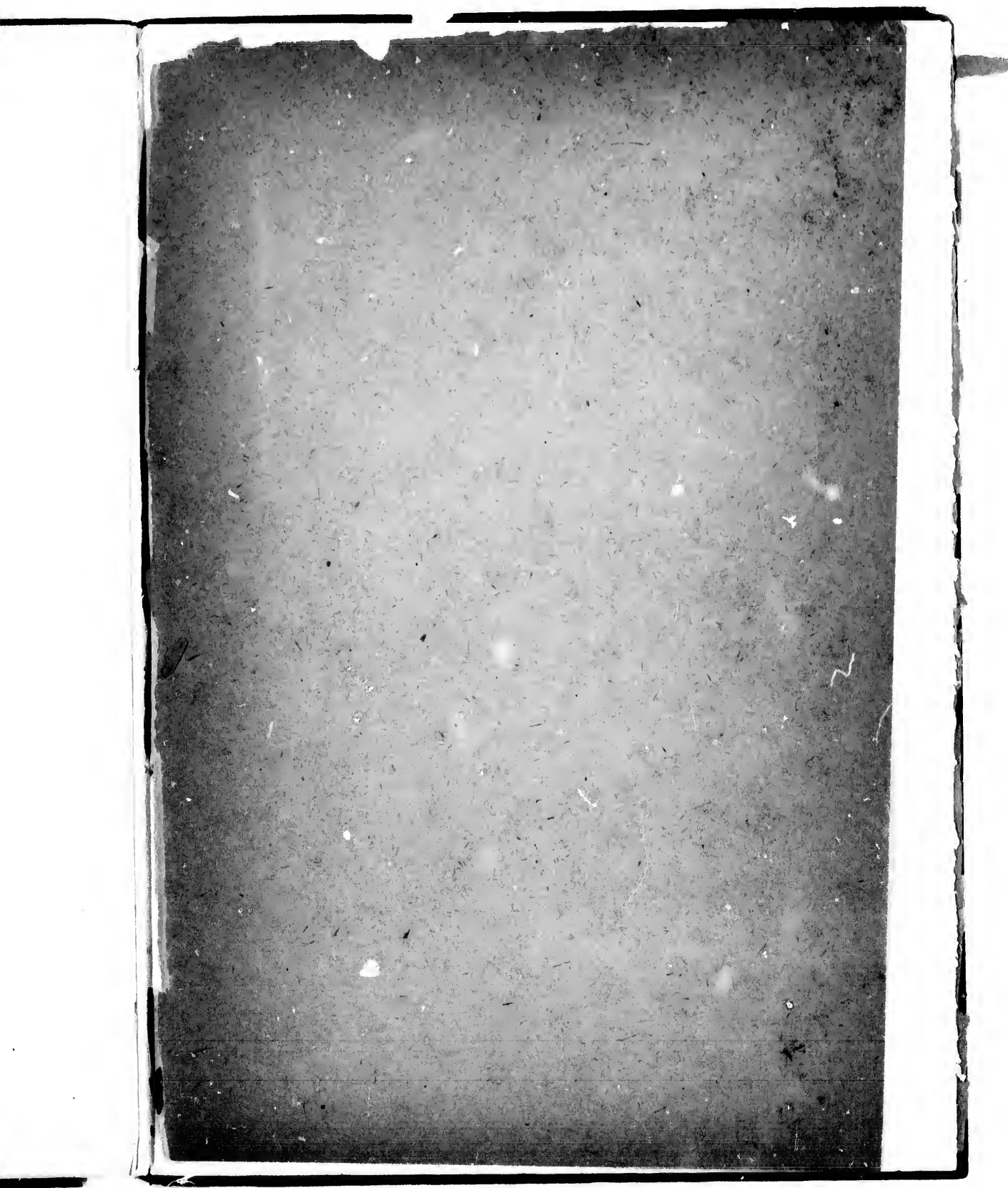
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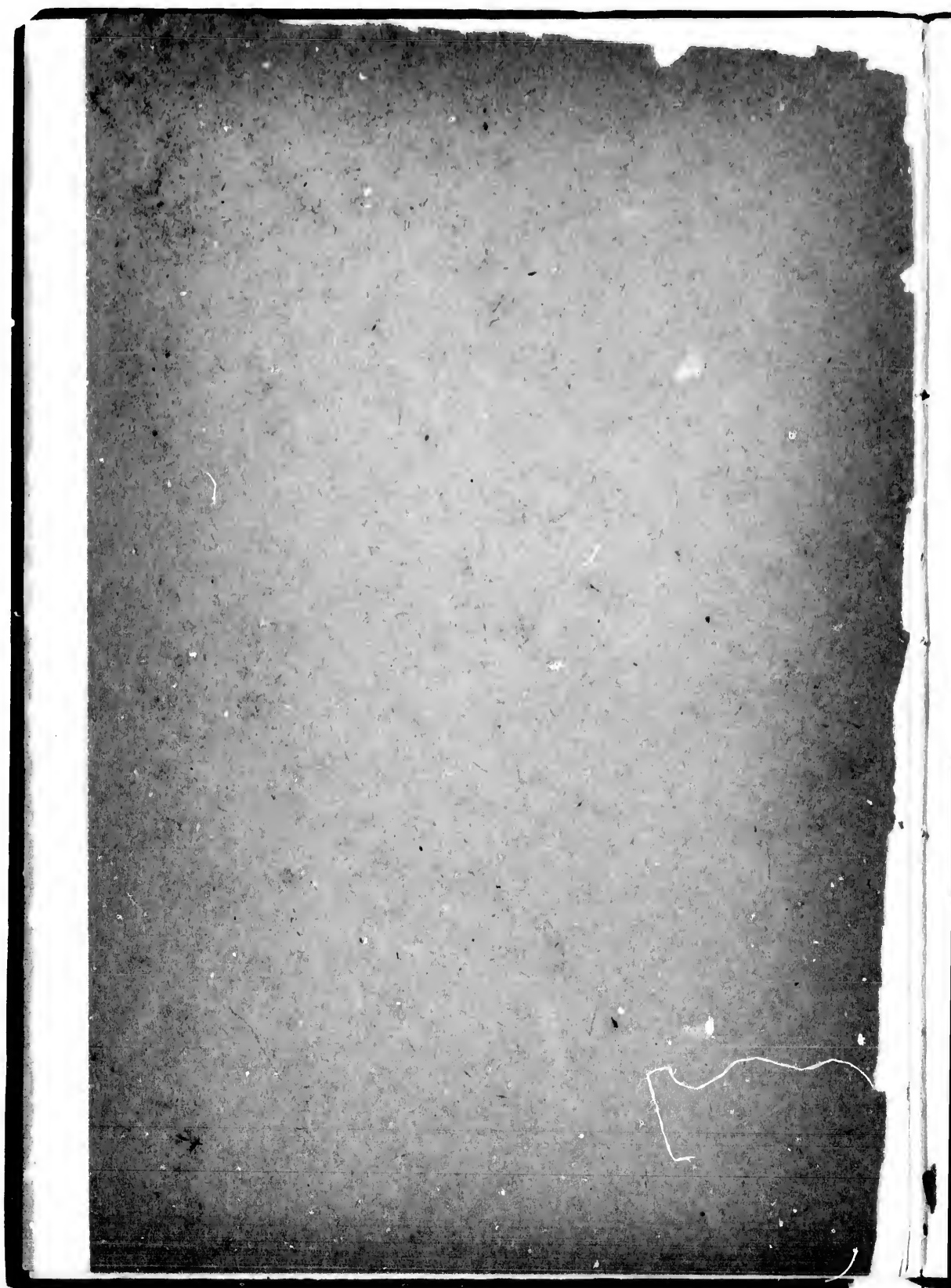
No. 96145, U. S.

No. 98144,

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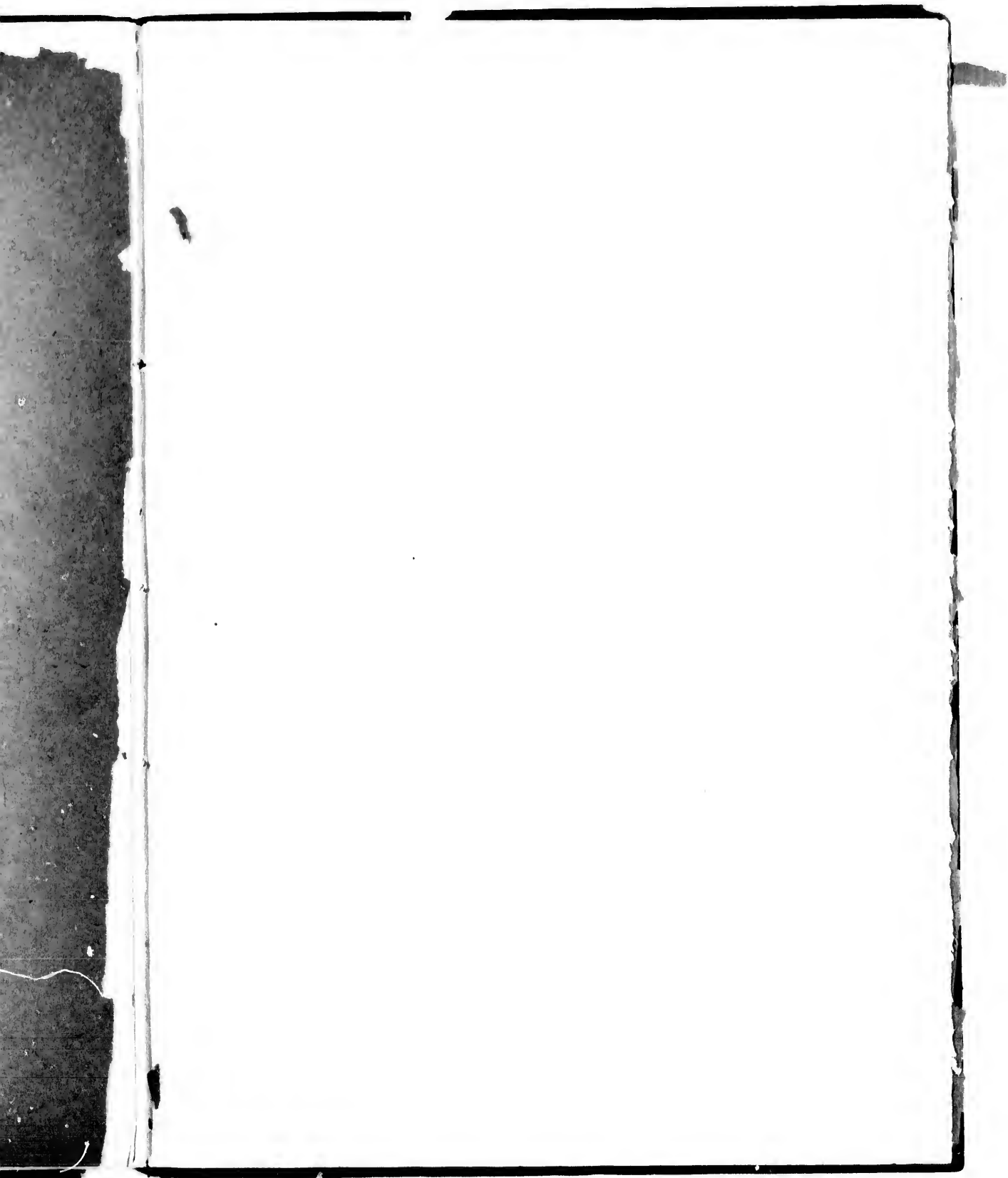


PLATE XXXVII.

Carnassial and molar teeth of Red Foxes. All natural size.

- FIG. 1. *Vulpes fulvus*, ♂, yg. ad. Laurel, Maryland, Nov. 14, 1899. No. 101488, U. S. Nat. Mus.
2. *Vulpes deletrix*, ♀. Bay St. George, Newfoundland, April 24, 1897. No. 6967, Bangs Coll. Type.
3. *Vulpes rubricosa*, ♀ ad. Digby, Nova Scotia, Oct. 13, 1893. No. 116, Bangs Coll. Type.



TEETH OF RED FOXES

ize.

No. 101488,

April 24, 1897.

No. 116,

(676)



