The Report of the Japan Wintering Bird Atlas

2016 - 2022

bird-atlas.jp

Summary

The Japan Wintering Bird Atlas (JWBA) survey was conducted during the wintering season from January 2016 to February 2022. Records of 451 bird species were compiled with the help from 396 surveyors who submitted a total of 105,660 questionnaires from all over the country. Additional information included 788,148 records extracted from databases and other sources. 40-km mesh grids were laid over the map of Japan, and range maps for 309 species that had been recorded in 10 or more meshes, and species that known to have restricted distribution were made. Results of this recent survey was compared with those of the Environment Agency's surveys conducted in the 1980s.

The species with the highest number of meshes recorded were, in order of dominance, Brown-eared Bulbul, Large-billed Crow, Dusky Thrush, Japanese Tit, and Carrion Crow. There are no big differences between the top species in the present survey and survey conducted in the 1980s.

Birds that showed the most significant range expansions included non-native and reintroduced species such as Chinese Hwamei, Snow Goose, Red-billed Leiothrix, Cackling Goose, and Oriental Stork. Other top species were mostly waterbirds that forage in shallow water or on the ground. The top declining species were Budgerigar, Japanese Quail, Striated Heron, Crested Kingfisher, and Intermediate Egret, many of which also showed a declining trend in the Japan Breeding Bird Atlas (JBBA).

Looking at groups by habitat and life form, there was no significant northward or southward trend in range expansion for arboreal, grassland, forest ground-feeding birds, seabirds, and raptors. In contrast, most species that showed northward range expansion had characteristics such as foraging on the ground in open areas, using shallow water areas, submerged foraging in terrestrial aquatic system, and aerial foraging. Since many birds with these characteristics are assumed susceptible to snow cover and freezing, their northward range expansion may be due to the recent decrease in snow cover and freezing conditions. In addition, many of the aerial foraging species are summer visitors in Japan because of reduced food availability during the winter months. Global warming is likely to increase the possibility of these birds wintering in Japan.

Contents

Summary 1
Methods 1
Survey Results 3
Hazel Grouse 4
Rock Ptarmigan 4
Japanese Quail 5
Copper Pheasant 5
Green Pheasant 6
Swan Goose 6
Tundra Bean Goose 7
Greylag Goose 7
Greater White-fronted Goose 8
Lesser White-fronted Goose 8
Snow Goose 9
Cackling Goose 9
Brant Goose 10
Tundra Swan 10
Whooper Swan 11
Common Shelduck 11
Mandarin Duck 12
Gadwall 12
Falcated Duck 13
Eurasian Wigeon 13
American Wigeon 14
Mallard 14
Eastern Spot-billed Duck 15
Northern Shoveler 15
Northern Pintail 16
Garganey 16
Baikal Teal 17
Eurasian Teal 17
Canvasback 18
Common Pochard 18
Baer's Pochard 19
Ferruginous Duck 19
Tufted Duck 20
Greater Scaup 20
Lesser Scaup 21
Harlequin Duck 21
White-winged Scoter 22
Black Scoter 22
Long-tailed Duck 23
Common Goldeneye 23
Smew 24
Common Merganser 24
Red-breasted Merganser 25
Scaly-sided Merganser 25
Little Grebe 26
Red-necked Grebe 26
Great Crested Grebe 27
Horned Grebe 27
Black-necked Grebe 28
Japanese Wood Pigeon 28
Oriental Turtle Dove 29
Common Emerald Dove 29
White-bellied Green Pigeon 30
Whistling Green Pigeon 30
Red-throated Loon 31
Black-throated Loon 31
Pacific Loon 32
Oriental Stork 32
Brown Booby 33
Pelagic Cormorant 33
Great Cormorant 34
Japanese Cormorant 34
Eurasian Bittern 35
Cinnamon Bittern 35
Malayan Night Heron 36
Black-crowned Night Heron 36
Striated Heron 37
Chinese Pond Heron 37
Eastern Cattle Egret 38
Grey Heron 38
Purple Heron 39
Great Egret 39
Intermediate Egret 40
Little Egret 40
Pacific Reef Heron 41
Crested Ibis 41
Eurasian Spoonbill 42
Black-faced Spoonbill 42
Siberian Crane 43
Sandhill Crane 43
White-naped Crane 44
Red-crowned Crane 44
Common Crane 45
Hooded Crane 45
Demoiselle Crane 46
Swinhoe's Rail 46
Slaty-legged Crake 47
Okinawa Rail 47
Brown-cheeked Rail 48
White-breasted Waterhen 48
Ruddy-breasted Crake 49
Common Moorhen 49
Eurasian Coot 50
House Swift 50
Northern Lapwing 51
Grey-headed Lapwing 51
Pacific Golden Plover 52
Grey Plover 52
Common Ringed Plover 53
Long-billed Plover 53
Little Ringed Plover 54
Kentish Plover 54
Lesser Sand Plover 55
Greater Sand Plover 55
Eurasian Oystercatcher 56
Black-winged Stilt 56
Pied Avocet 57
Eurasian Woodcock 57
Amami Woodcock 58
Solitary Snipe 58
Common Snipe 59
Long-billed Dowitcher 59
Bar-tailed Godwit 60
Eurasian Whimbrel 60
Eurasian Curlew 61
Far Eastern Curlew 61
Spotted Redshank 62
Common Redshank 62
Marsh Sandpiper 63
Common Greenshank 63
Green Sandpiper 64
Wood Sandpiper 64
Grey-tailed Tattler 65
Terek Sandpiper 65
Common Sandpiper 66
Ruddy Turnstone 66
Sanderling 67
Red-necked Stint 67
Little Stint 68
Temminck's Stint 68
Long-toed Stint 69
Sharp-tailed Sandpiper 69
Dunlin 70
Ruff 70
Greater Painted-snipe 71
Barred Buttonquail 71
Black-legged Kittiwake 72
Black-headed Gull 72
Saunders's Gull 73
Black-tailed Gull 73
Mew Gull 74
Glaucous-winged Gull 74
Glaucous Gull 75
Vega Gull 75
Slaty-backed Gull 76
Lesser Black-backed Gull 76
Caspian Tern 77
Thick-billed Murre 77
Common Murre 78
Spectacled Guillemot 78
Ancient Murrelet 79
Japanese Murrelet 79
Rhinoceros Auklet 80
Western Osprey 80
Black-winged Kite 81
Black Kite 81
White-tailed Eagle 82
Steller's Sea Eagle 82
Crested Serpent Eagle 83
Eastern Marsh Harrier 83
Hen Harrier 84
Japanese Sparrowhawk 84
Eurasian Sparrowhawk 85
Northern Goshawk 85
Grey-faced Buzzard 86
Eastern Buzzard 86
Rough-legged Buzzard 87

Mountain Hawk-Eagle 87
Japanese Scops Owl 88
Ryukyu Scops Owl 88
Ural Owl 89
Northern Boobook 89
Long-eared Owl 90
Short-eared Owl 90
Eurasian Hoopoe 91
Common Kingfisher 91
Crested Kingfisher 92
Eurasian Wryneck 92
Japanese Pygmy Woodpecker 93
Lesser Spotted Woodpecker 93
White-backed Woodpecker 94
Great Spotted Woodpecker 94
Black Woodpecker 95
Japanese Green Woodpecker 95
Grey-headed Woodpecker 96
Okinawa Woodpecker 96
Common Kestrel 97
Merlin 97
Peregrine Falcon 98
Ashy Minivet 98
Bull-headed Shrike 99
Brown Shrike 99
Chinese Grey Shrike 100
Eurasian Jay 100
Lidth's Jay 101
Azure-winged Magpie 101
Eurasian Magpie 102
Spotted Nutcracker 102
Daurian Jackdaw 103
Rook 103
Carrion Crow 104
Large-billed Crow 104
Northern Raven 105
Goldcrest 105
Chinese Penduline Tit 106
Marsh Tit 106
Willow Tit 107
Varied Tit 107
Coal Tit 108
Japanese Tit 108
Eurasian Skylark 109
Barn Swallow 109
Pacific Swallow 110
Asian House Martin 110
Light-vented Bulbul 111
Brown-eared Bulbul 111
Japanese Bush Warbler 112
Asian Stubtail 112
Long-tailed Tit 113
Dusky Warbler 113
Yellow-browed Warbler 114
Bonin White-eye 114
Warbling White-eye 115
Marsh Grassbird 115
Zitting Cisticola 116
Bohemian Waxwing 116
Japanese Waxwing 117
Eurasian Nuthatch 117
Eurasian Treecreeper 118
Eurasian Wren 118
Red-billed Starling 119
White-cheeked Starling 119
Chestnut-cheeked Starling 120
White-shouldered Starling 120
Common Starling 121
Brown Dipper 121
White's Thrush 122
Japanese Thrush 122
Eyebrowed Thrush 123
Pale Thrush 123
Brown-headed Thrush 124
Izu Thrush 124
Dusky Thrush 125
Fieldfare 125
Ryukyu Robin 126
Siberian Rubythroat 126
Red-flanked Bluetail 127
Daurian Redstart 127
Stejneger's Stonechat 128
Blue Rock Thrush 128
Taiga/Red-breasted Flycatcher 129
Alpine Accentor 129
Japanese Accentor 130
Russet Sparrow 130
Eurasian Tree Sparrow 131
Eastern Yellow Wagtail 131
Grey Wagtail 132
White Wagtail 132
Japanese Wagtail 133
Richard's Pipit 133
Olive-backed Pipit 134
Red-throated Pipit 134
Buff-bellied Pipit 135
Brambling 135
Grey-capped Greenfinch 136
Eurasian Siskin 136
Common Redpoll 137
Asian Rosy Finch 137
Long-tailed Rosefinch 138
Pallas's Rosefinch 138
Pine Grosbeak 139
Red Crossbill 139
Eurasian Bullfinch 140
Hawfinch 140
Chinese Grosbeak 141
Japanese Grosbeak 141
Snow Bunting 142
Meadow Bunting 142
Chestnut-eared Bunting 143
Little Bunting 143
Rustic Bunting 144
Yellow-throated Bunting 144
Yellow Bunting 145
Black-faced Bunting 145
Grey Bunting 146
Pallas's Reed Bunting 146
Japanese Reed Bunting 147
Common Reed Bunting 147
Chinese Bamboo Partridge 148
Indian Peafowl 148
Black Swan 149
Mute Swan 149
Rock Dove 150
Eurasian Collared Dove 150
Budgerigar 151
Rose-ringed Parakeet 151
Red-billed Blue Magpie 152
Chinese Hwamei 152
Moustached Laughingthrush 153
Masked Laughingthrush 153
White-browed Laughingthrush 154
Red-billed Leiothrix 154
Crested Myna 155
Common Myna 155
Red Avadavat 156
Scaly-breasted Munia 156
Tricolored Munia 157
White-headed Munia 157
Java Sparrow 158
Status of wintering birds 159
Increase/decrease species 162

Methods

The Japan Wintering Bird Atlas (JWBA) survey was conducted during the wintering season from January 2016 to February 2022 in parallel with the Japan Breeding Bird Atlas (JBBA) survey. Present status of birds and changes from the past can be revealed by comparing the results with the third basic survey conducted by the Environment Agency in 1984-1986 (Environment Agency 1988), in which the range of wintering birds was investigated.

The Japan Bird Research Association (JBRA) and the Wild Bird Society of Japan (WBSJ) served as the secretariat for the survey. This project was supported by the Pro Natura Foundation Japan. Participants in the JBBA were invited to provide winter observation information from January 2016 to February 2022 by reporting data to the website*. We also called on the members of the JBRA and participants of the Monitoring Site 1000 survey to provide information. In addition to the information provided by these sources, we collected information from databases and other sources. As for database information, we used the "Field Notes" (a bird record database of the JBRA), the bird-watching event database of the WBSJ, and eBird Japan. However, records in the Field Notes and eBird Japan may include errors due to misidentification or typo. In suspicious cases from the Field Notes, the secretariat would contact the observers for confirmation. In cases that confirmation of record on Field Notes was not obtained, or odd distribution location shown from eBird Japan, the secretariat would consider not to use such questionable data. In addition, results of the bird survey at Monitoring Site 1000 of the Ministry of the Environment and information from various literatures were also used.

These data were aggregated into meshes of about 40 km square (Fig. 1) consisting of 16 quadratic meshes of standard regional meshes and compiled them into a range map.

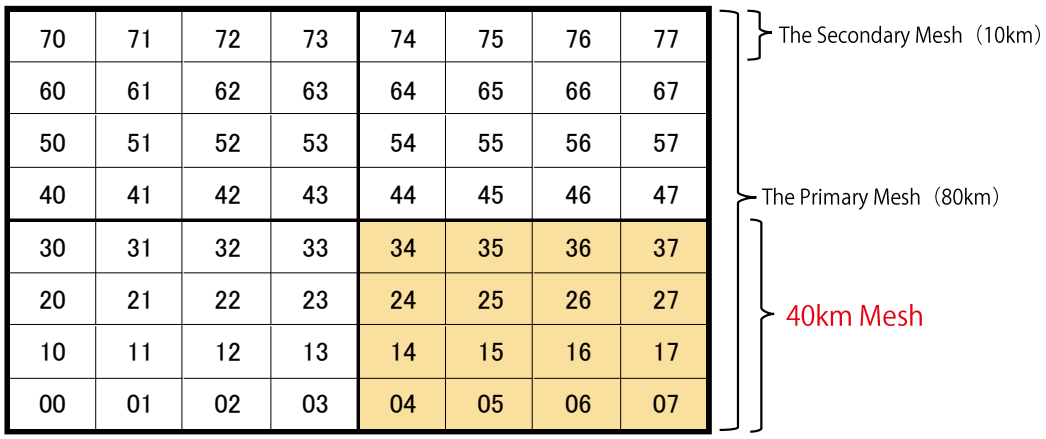


Fig. 1. Relationship between the 40 km mesh used in this study and the primary and secondary meshes.

In preparing the range maps, we selected 309 species that were recorded in more than 10 meshes of the 40-km mesh to exclude a small number of irregularly visiting species. However, species that are known to have a naturally restricted distribution, such as island-dwelling species and cranes, are included in this report.

* https://www.bird-atlas.jp/winter.html

Survey Results

105,660 wintering records from 396 survey participants were received. In addition, the data from JBRA's Field Notes (383,269 records), eBird Japan (316,113 records), the Bird Watching Database of the WBSJ (61,124 records), Monitoring Site 1000, and literature (27,642 records) were added to the total.

As a result, 451 species were recorded. The range maps of 309 species, including common species and species with localized ranges, are shown on the following pages and thereafter. There are, however, a few cautions when comparing the results of the two survey periods: 1) the data quality differed from the observation data collected during the 1984-1986 period (hereafter referred to as "the 1980s") and the 2016-2022 period (hereafter referred to as "the 2010s"), 2) the number of target meshes is different, with the 1980s based on 338 mesh information and the 2010s based on 370 mesh, and 3) many of the outlying islands were not surveyed in the 1980s, such as the northern Nansei Islands (e.g. Tanegashima, Yakushima, Amami Oshima and Tokunoshima), and many of the Izu Islands (Fig. 2). The above should be taken into account when comparing the range maps.

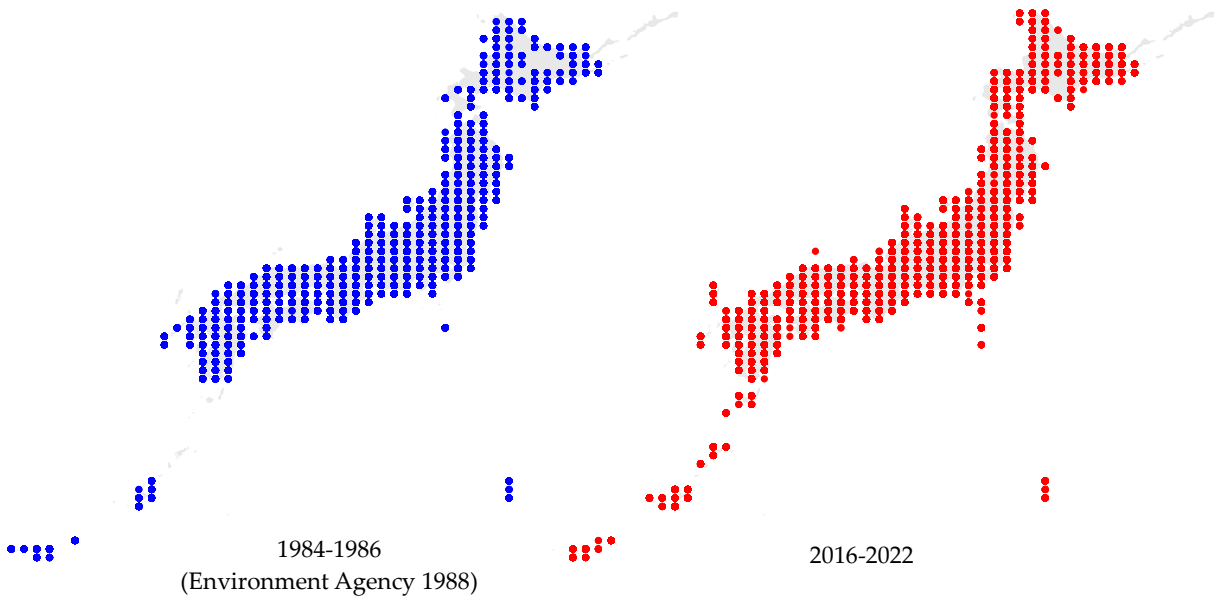
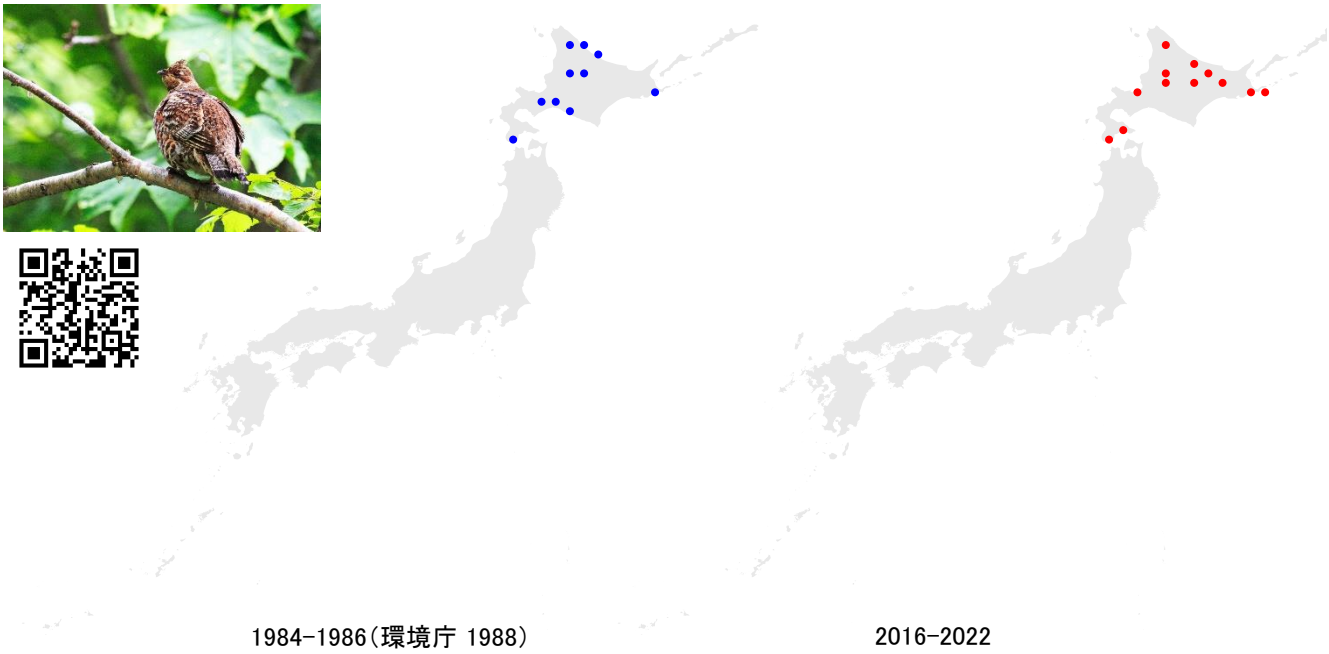
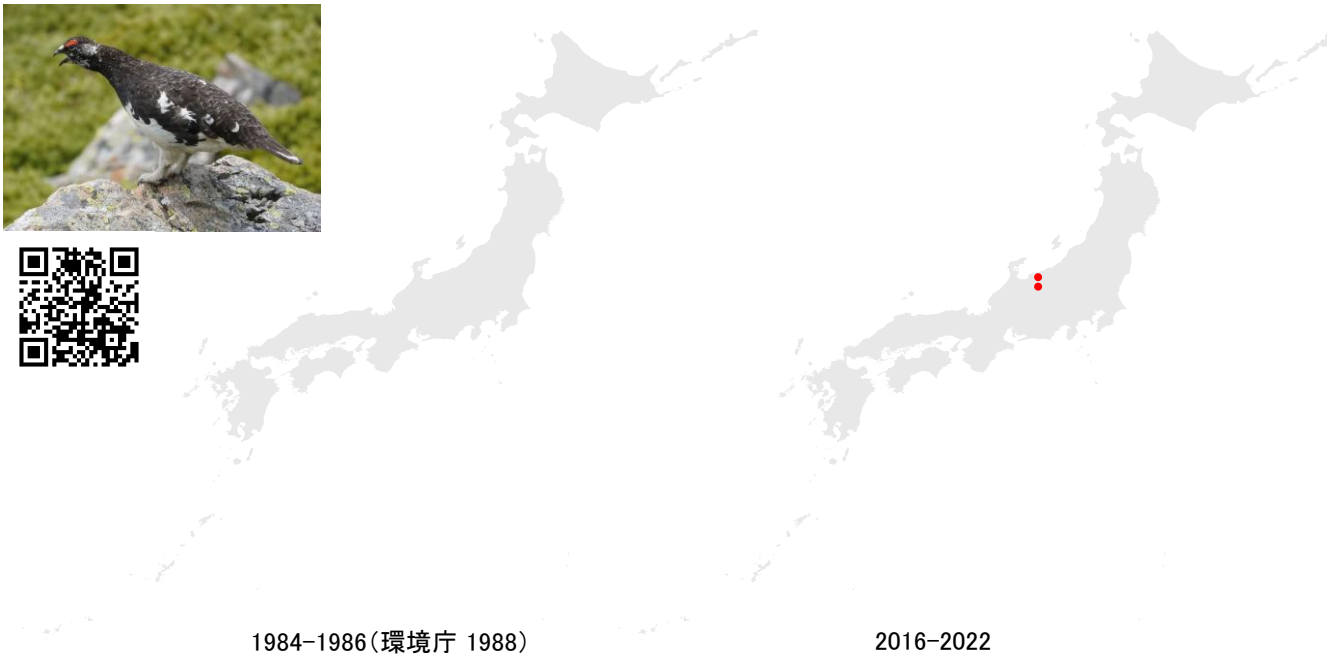


Fig. 2. Mesh for which information was obtained in the 1980s and 2010s surveys.

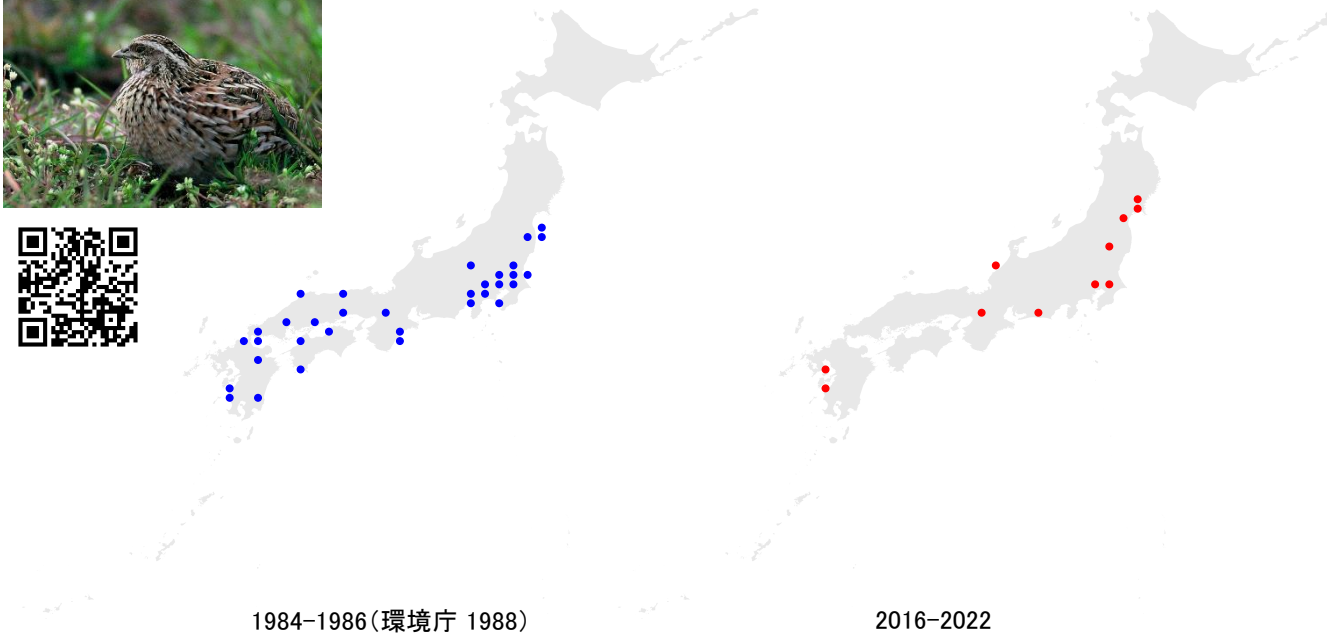
Hazel Grouse *Tetrastes bonasia* Length: 36cm Weight: ♂339-432g ♀319-421g



Rock Ptarmigan *Lagopus muta* Length: 35.0-37.8cm Weight: 424.9-604.1g

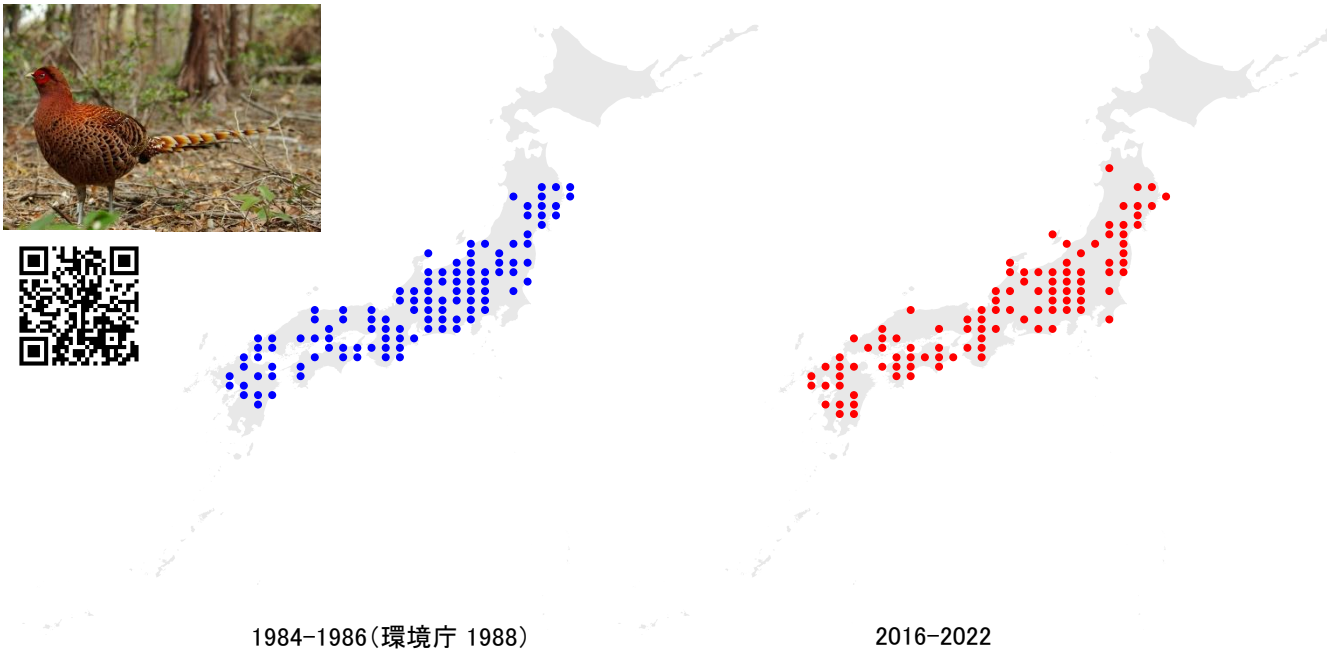


Japanese Quail　*Coturnix japonica*　Length：17-19cm　Weight：♂84-114g ♀90-115g



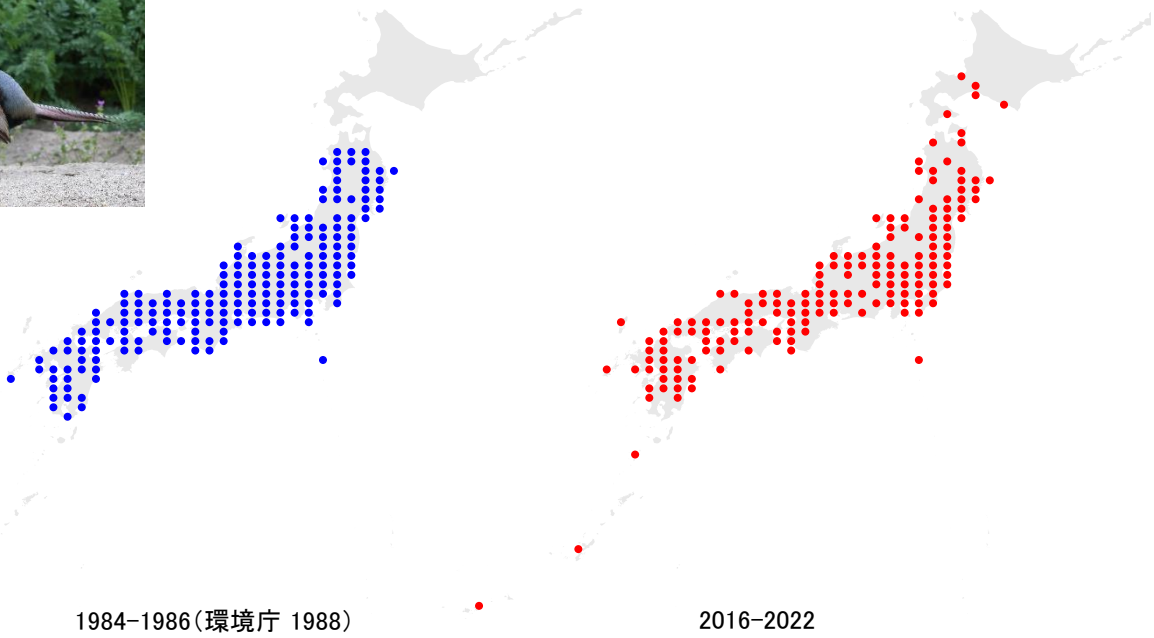
1984–1986（環境庁 1988）　2016–2022

Copper Pheasant　*Syrmaticus soemmerringii*　Length：♂125cm ♀55cm　Weight：♂943-1348g ♀745-1000g



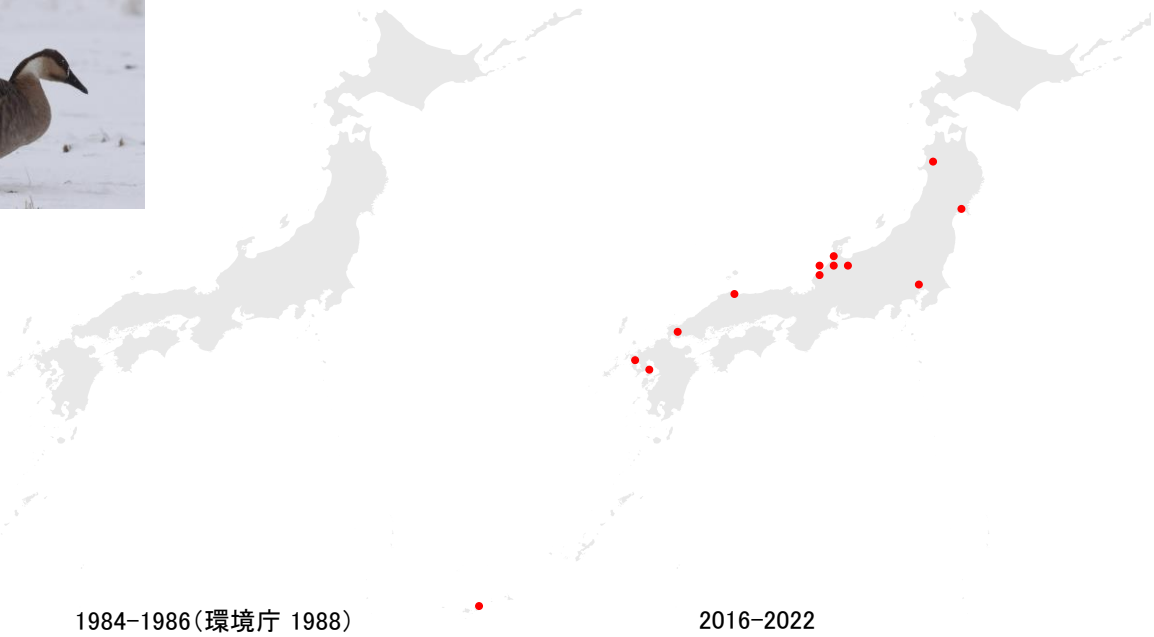
1984–1986（環境庁 1988）　2016–2022

Green Pheasant *Phasianus colchicus* Length: 60-80cm Weight: ♂847-1387g ♀692-970g



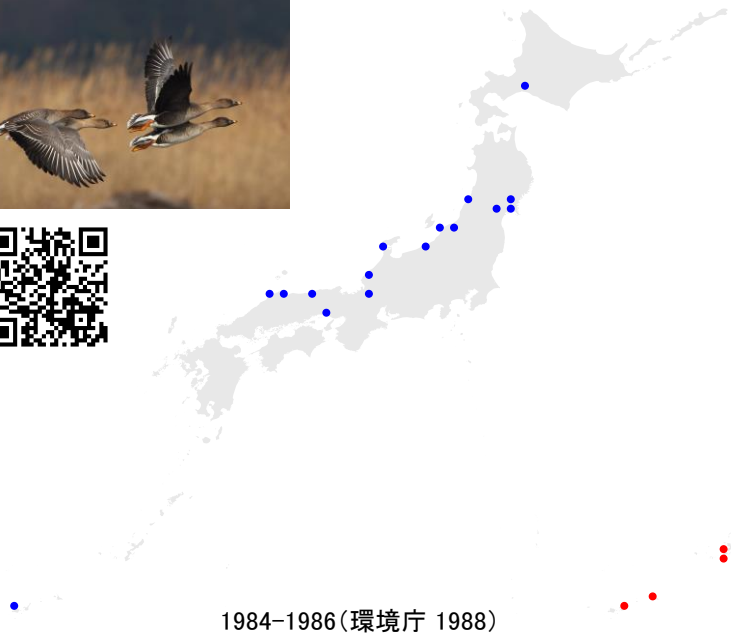
1984–1986（環境庁 1988） 2016–2022

Swan Goose *Anser cygnoides* Length: 81-94cm Weight: 2800-4200g

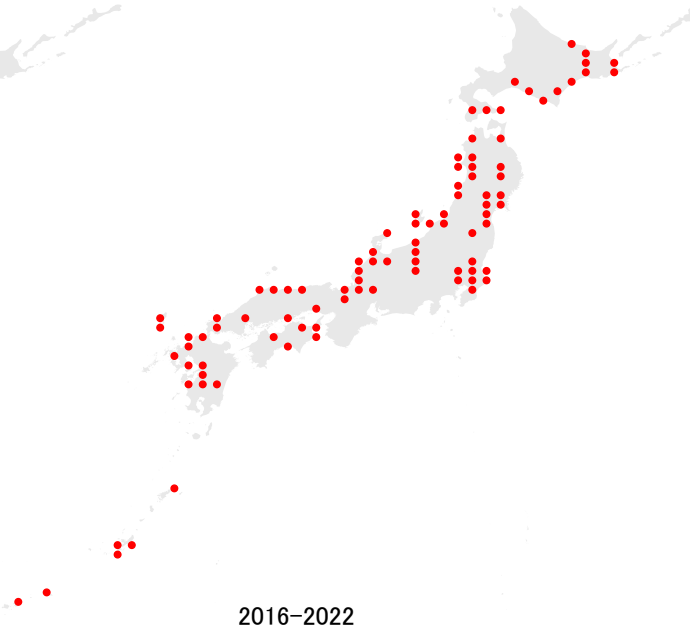


1984–1986（環境庁 1988） 2016–2022

Bean Goose *Anser fabalis* Length: 78-89cm Weight: 2800-4200g



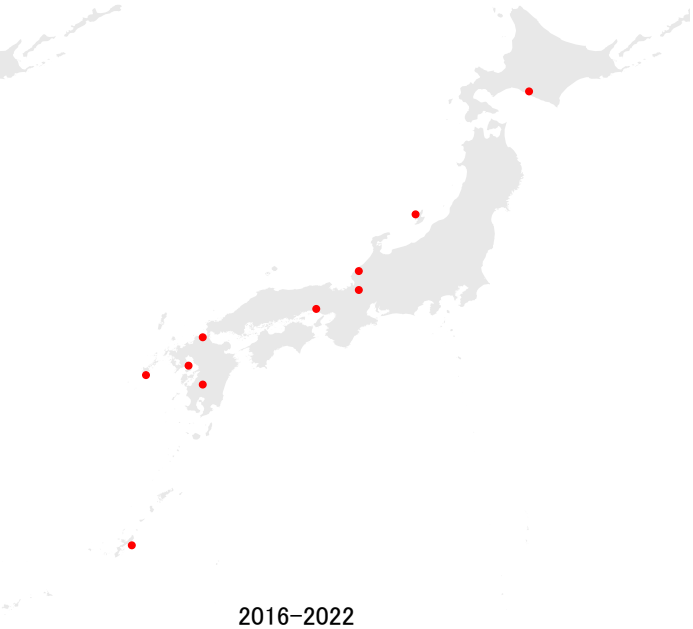
1984-1986（環境庁 1988）



2016-2022

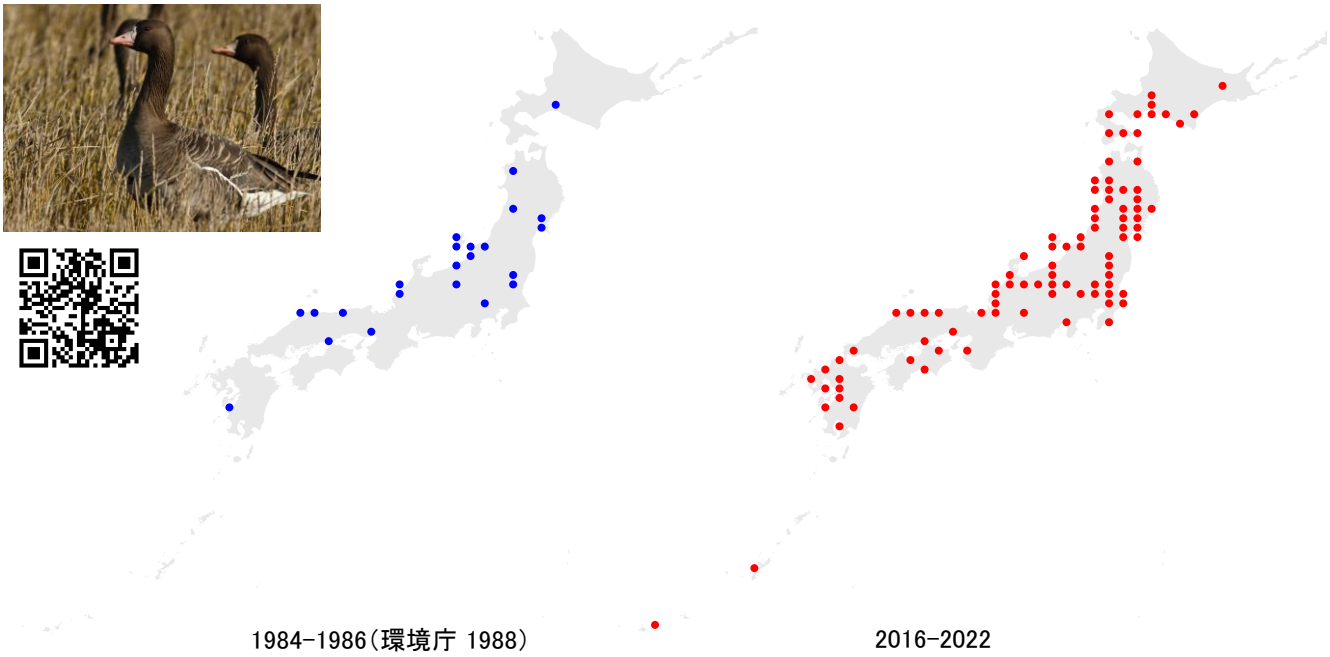
Greylag Goose *Anser anser* Length: 75-90cm Weight: 2000-4500g

1984-1986（環境庁 1988）



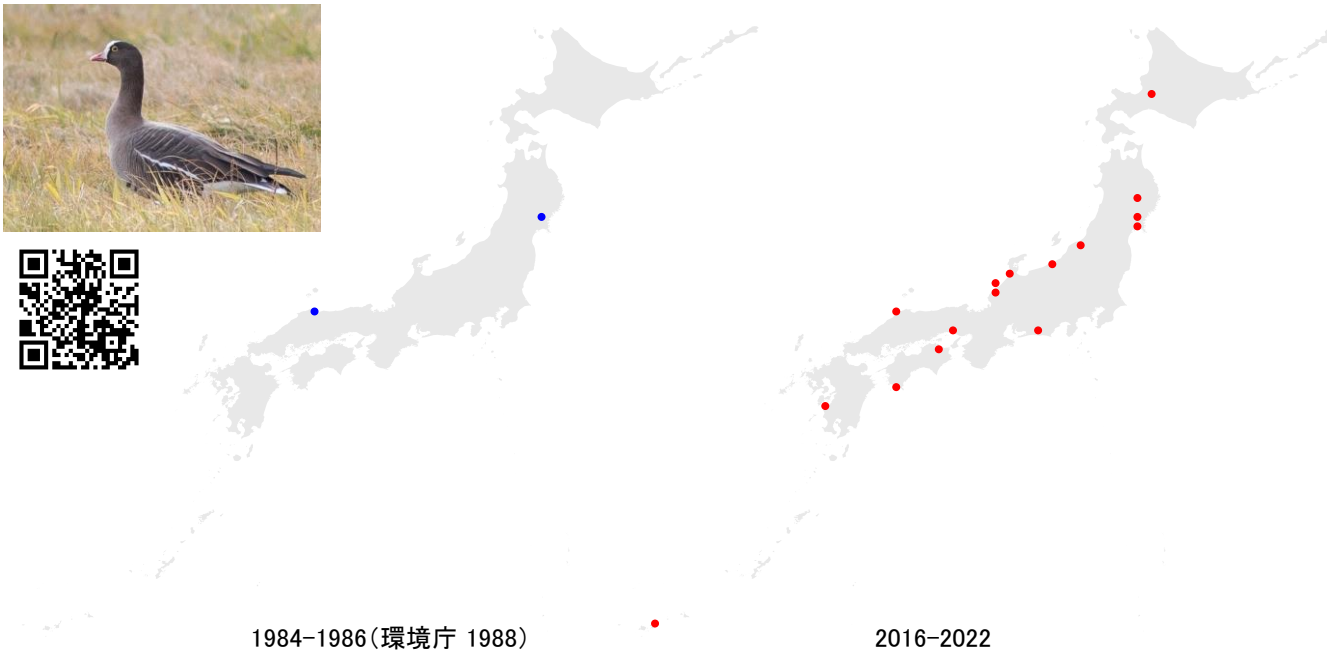
2016-2022

Greater White-fronted Goose *Anser albifrons* Length: 66-86cm Weight: 2265-3205g



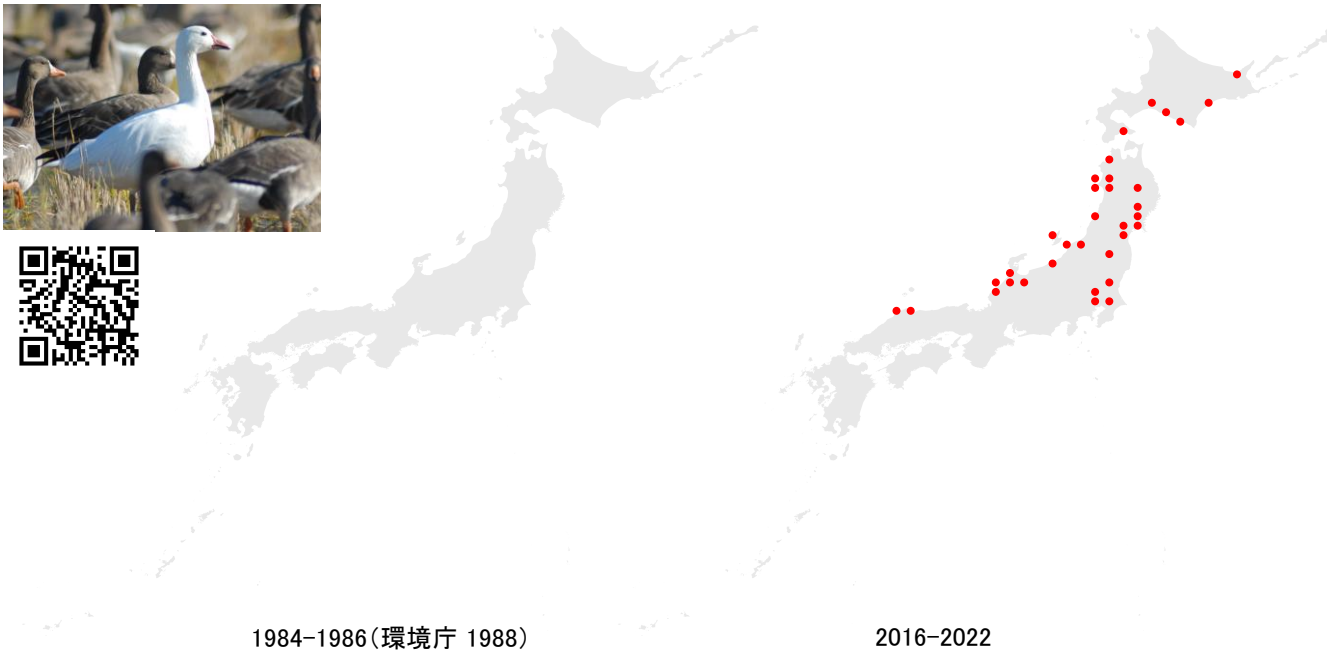
1984–1986（環境庁 1988） 2016–2022

Lesser White-fronted Goose *Anser erythropus* Length: 53-66cm Weight: 1400-2500g



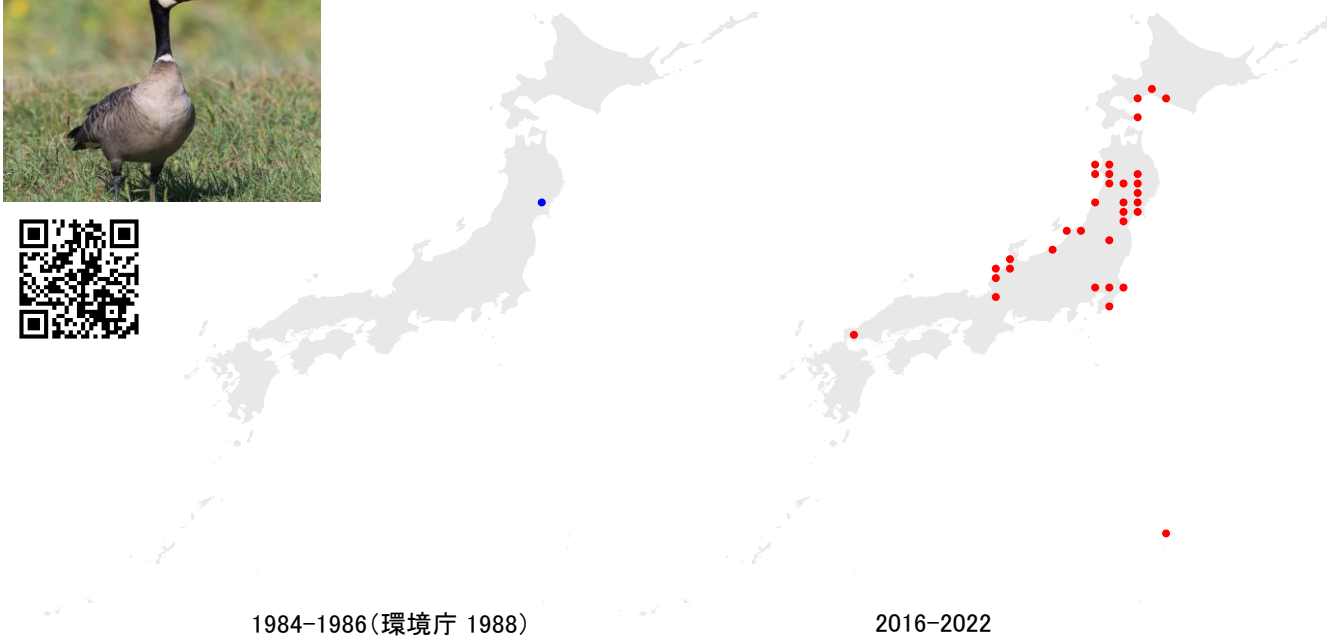
1984–1986（環境庁 1988） 2016–2022

Snow Goose　*Anser caerulescens*　Length：36-45cm　Weight：♂2292g ♀1932g



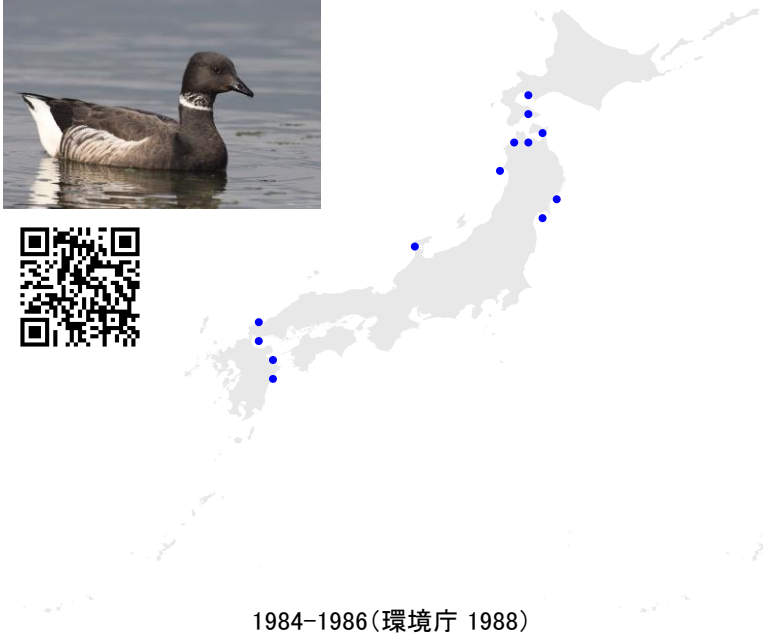
1984-1986（環境庁 1988）　2016-2022

Cackling Goose　*Branta hutchinsii*　Length：56-68cm　Weight：2000g

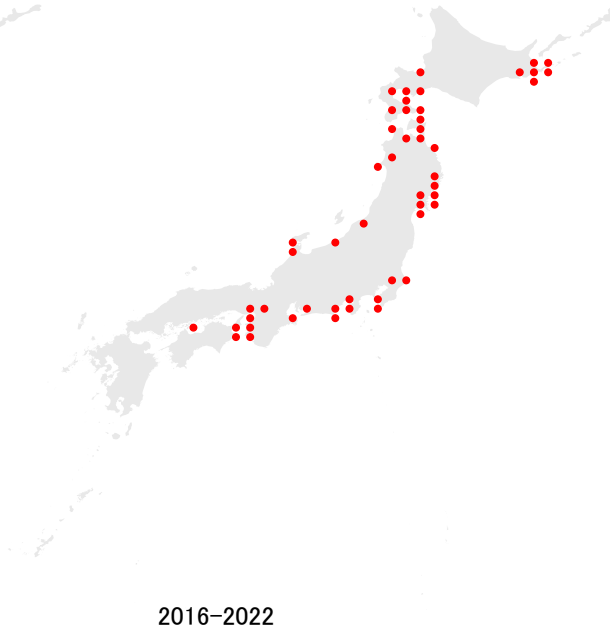


1984-1986（環境庁 1988）　2016-2022

Brant Goose *Branta bernicla* Length: 56-63.7cm Weight: 1167-1827g

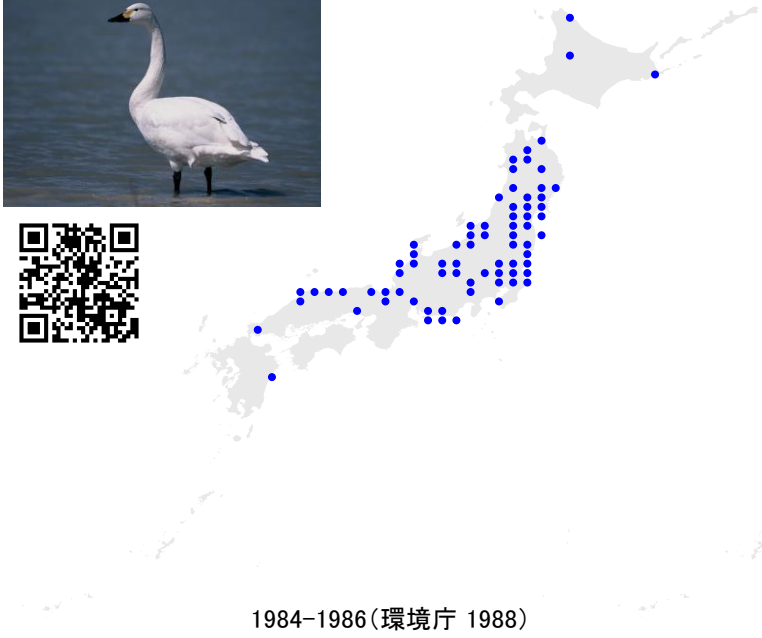


1984-1986（環境庁 1988）

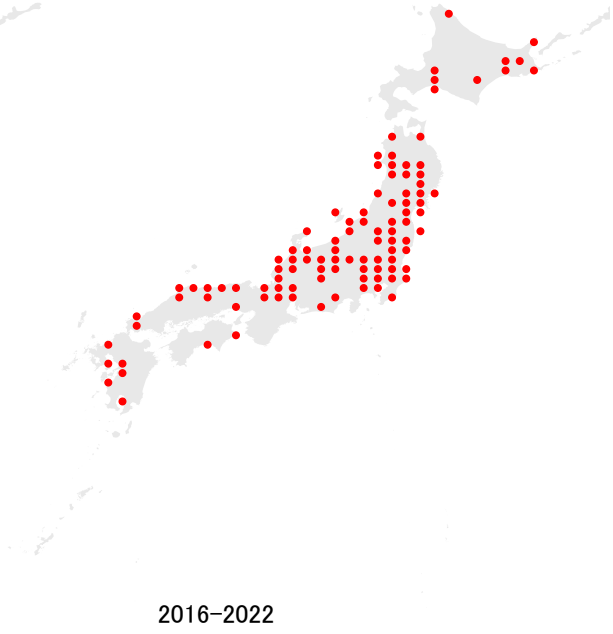


2016-2022

Tundra Swan *Cygnus columbianus* Length: 115-127cm Weight: ♂4900-7800g ♀3400-7200g

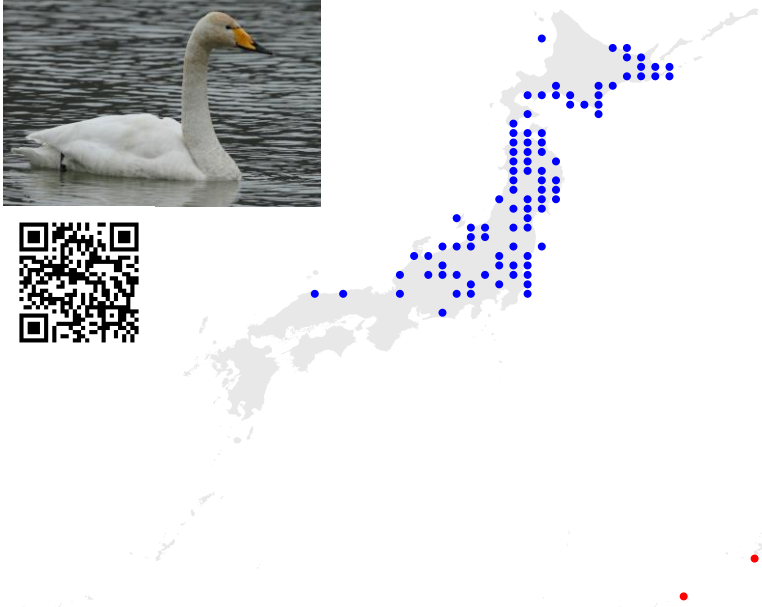


1984-1986（環境庁 1988）

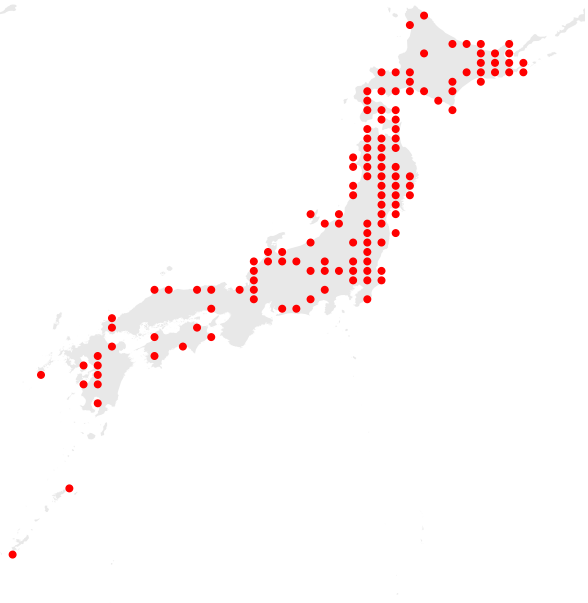


2016-2022

Whooper Swan *Cygnus cygnus* Length: 127.9-152.6cm Weight: 6750-12637.5g



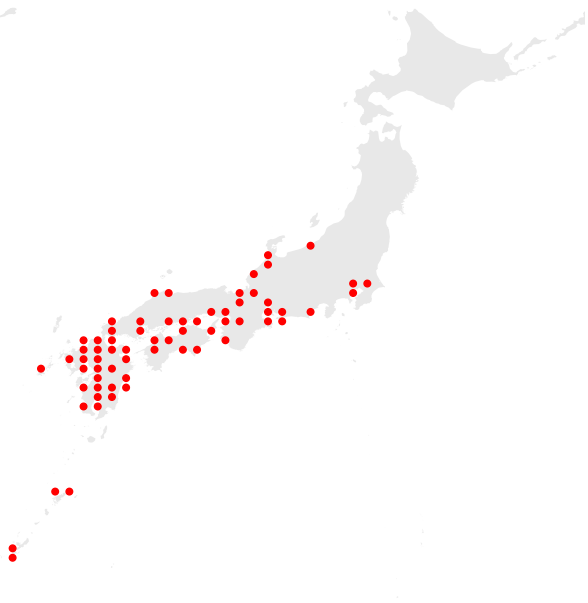
1984-1986（環境庁 1988）



2016-2022

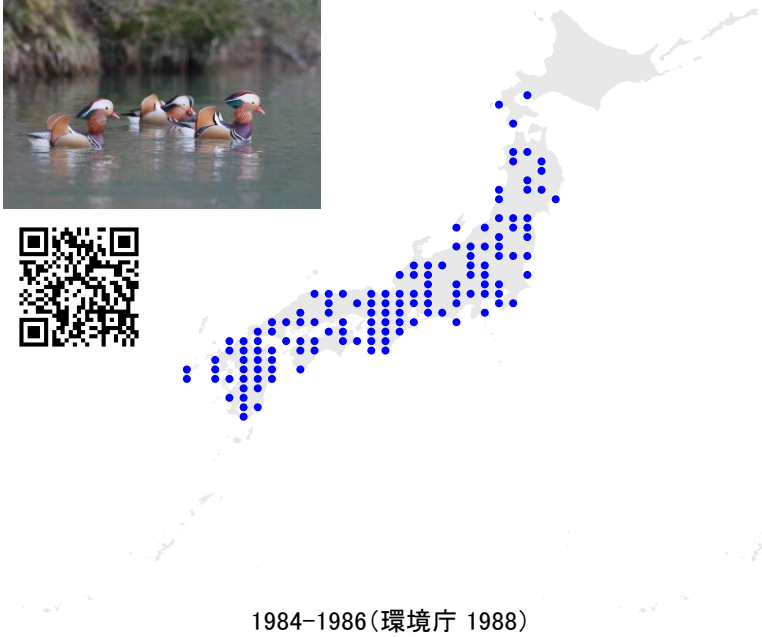
Common Shelduck *Tadorna tadorna* Length: 51-56cm Weight: 700-900g

1984-1986（環境庁 1988）

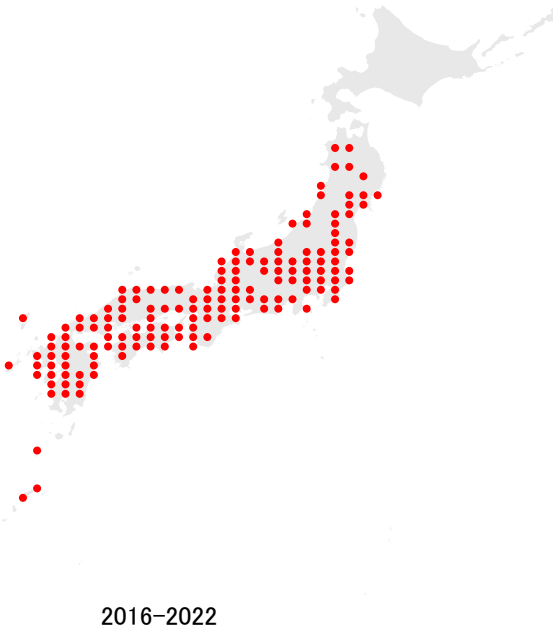


2016-2022

Mandarin Duck *Aix galericulata* Length: 45cm Weight: 443-550g

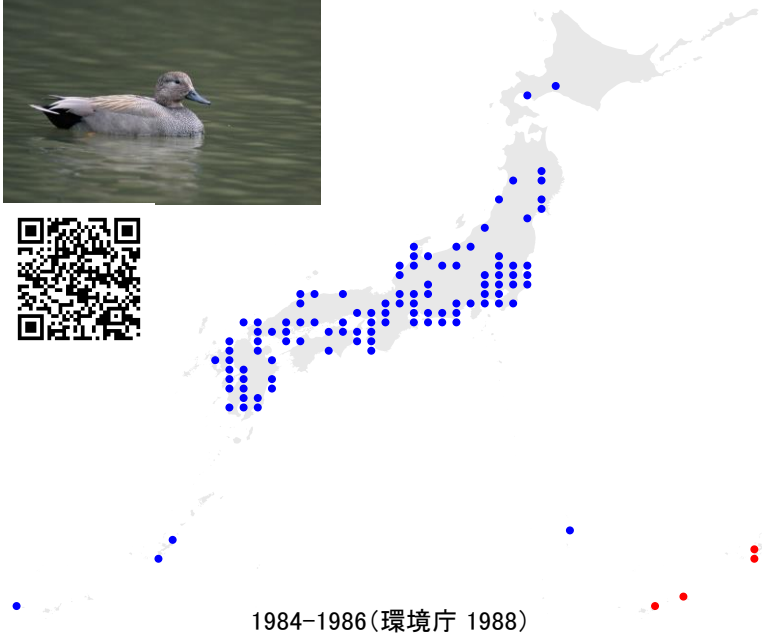


1984-1986（環境庁 1988）

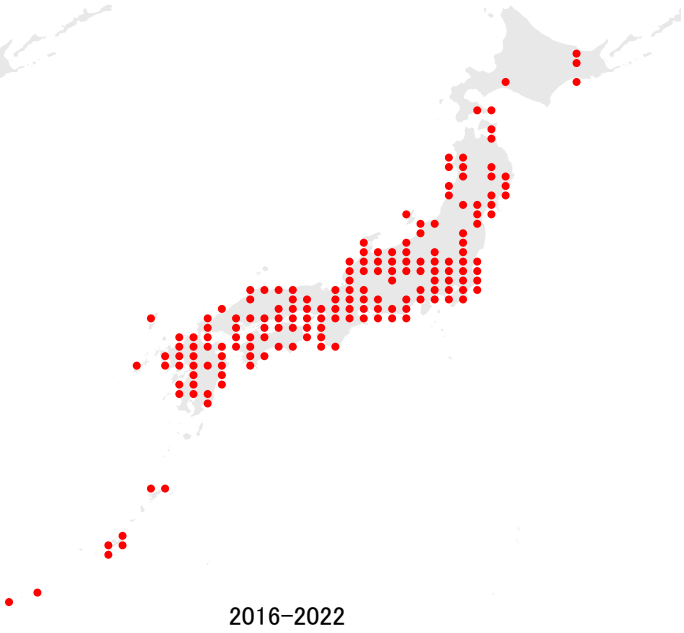


2016-2022

Gadwall *Anas strepera* Length: 48-58cm Weight: 850-990g

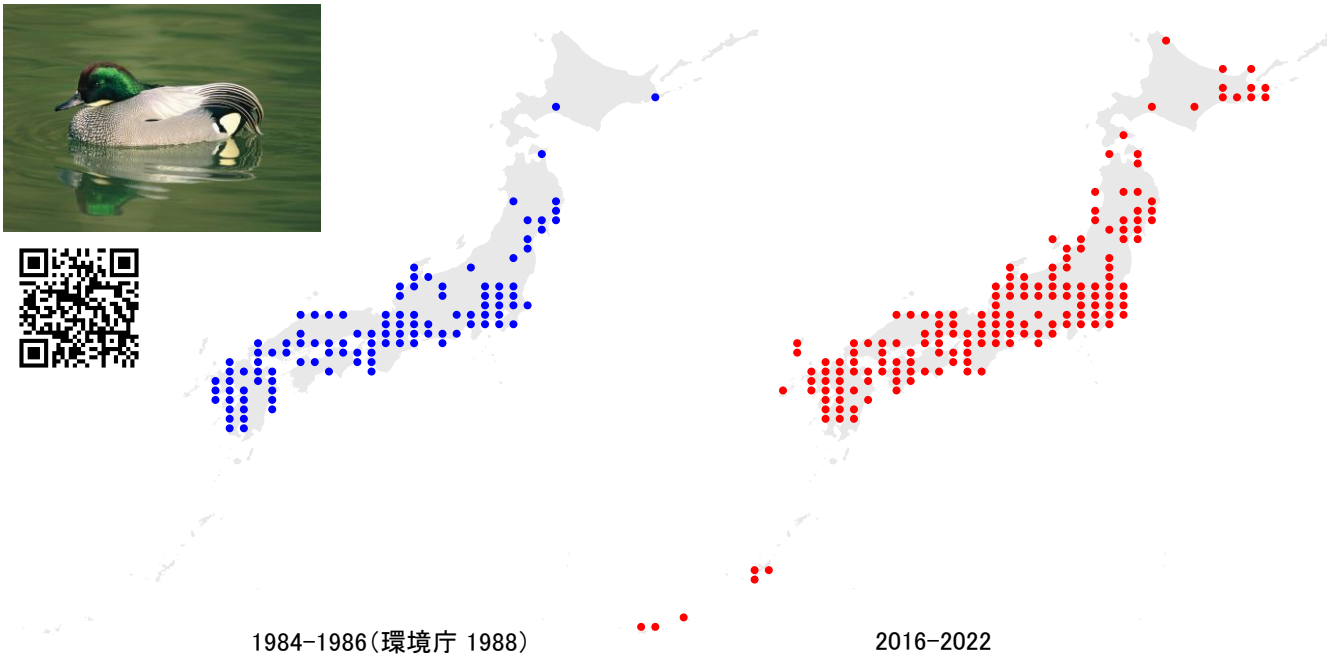


1984-1986（環境庁 1988）

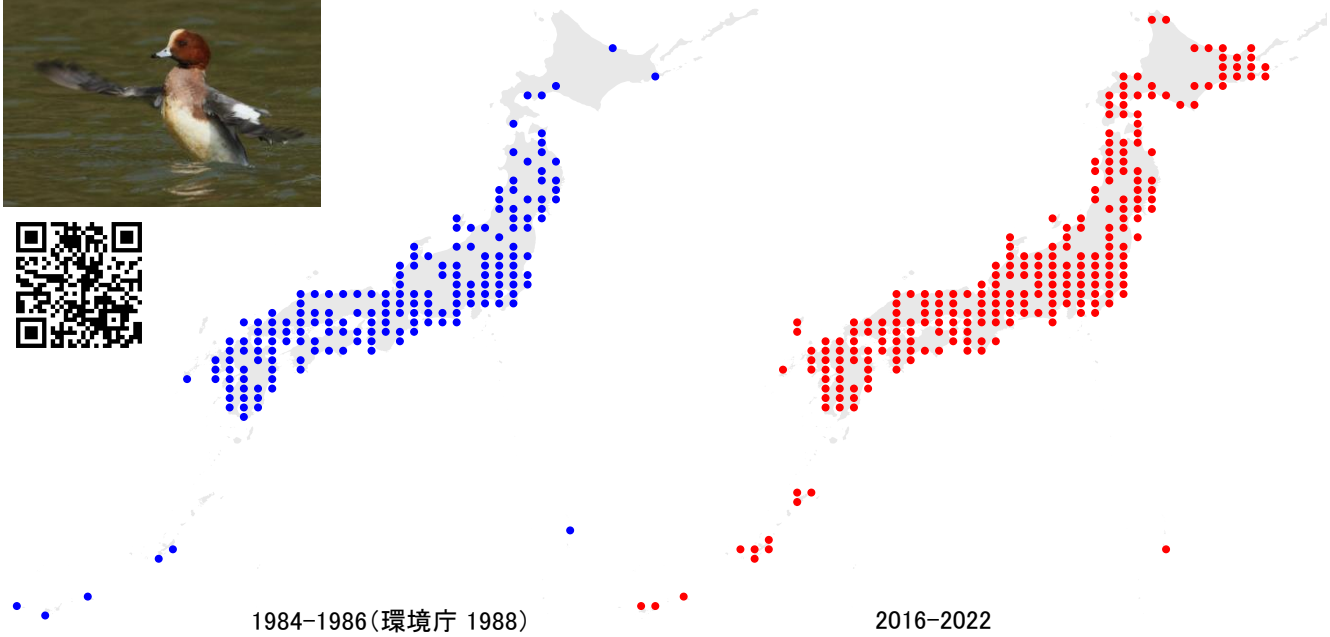


2016-2022

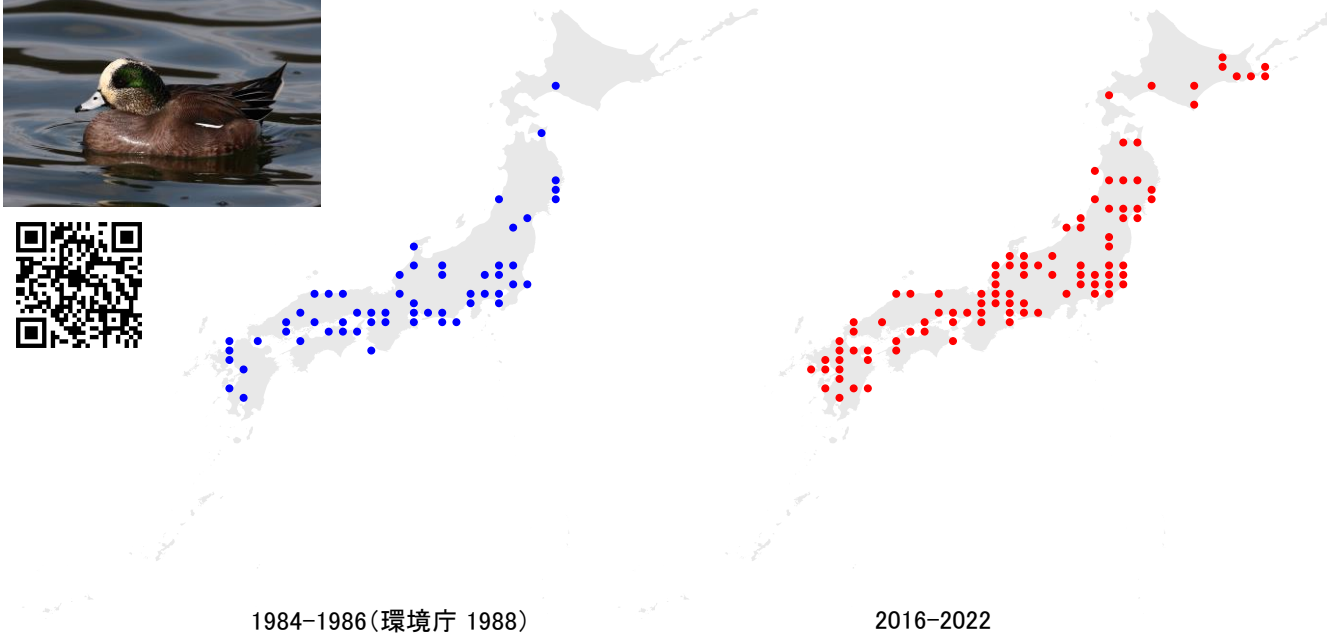
Falcated Duck *Anas falcata* Length: 46-53cm Weight: 580-710g



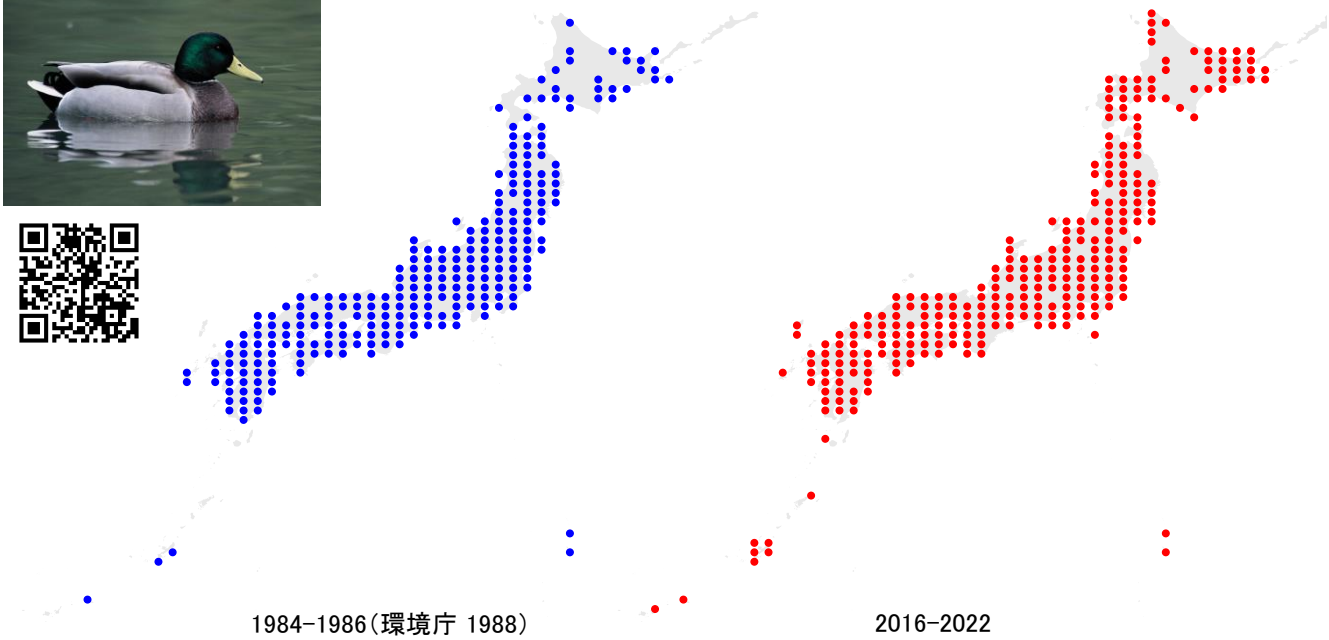
Eurasian Wigeon *Anas penelope* Length: 43-53cm Weight: 566-944g



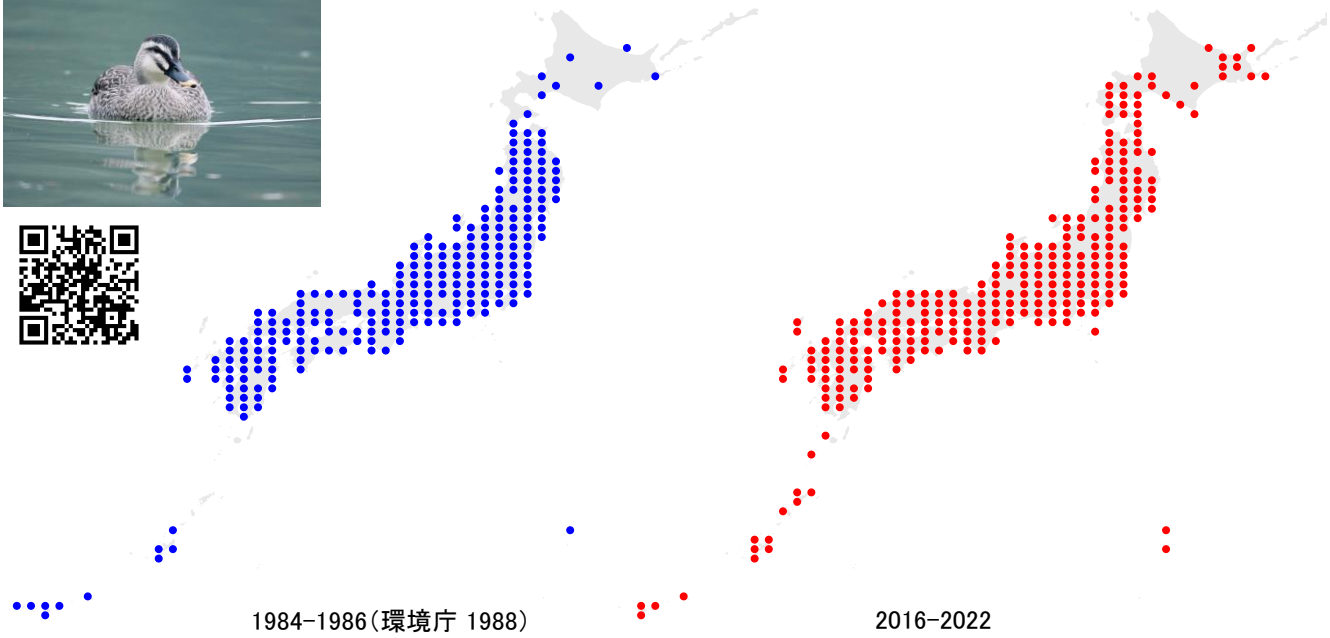
American Wigeon *Anas americana* Length: 46-58cm Weight: 680-770g



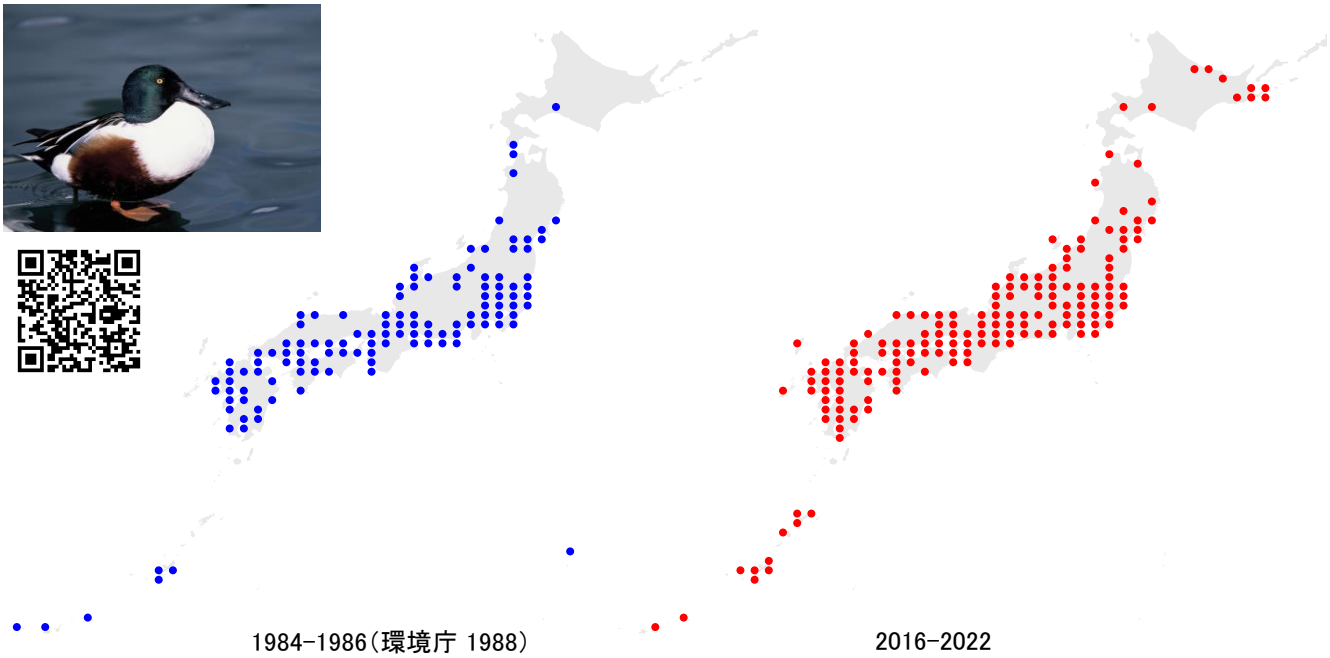
Mallard *Anas platyrhynchos* Length: 56-65cm Weight: 690-1500g



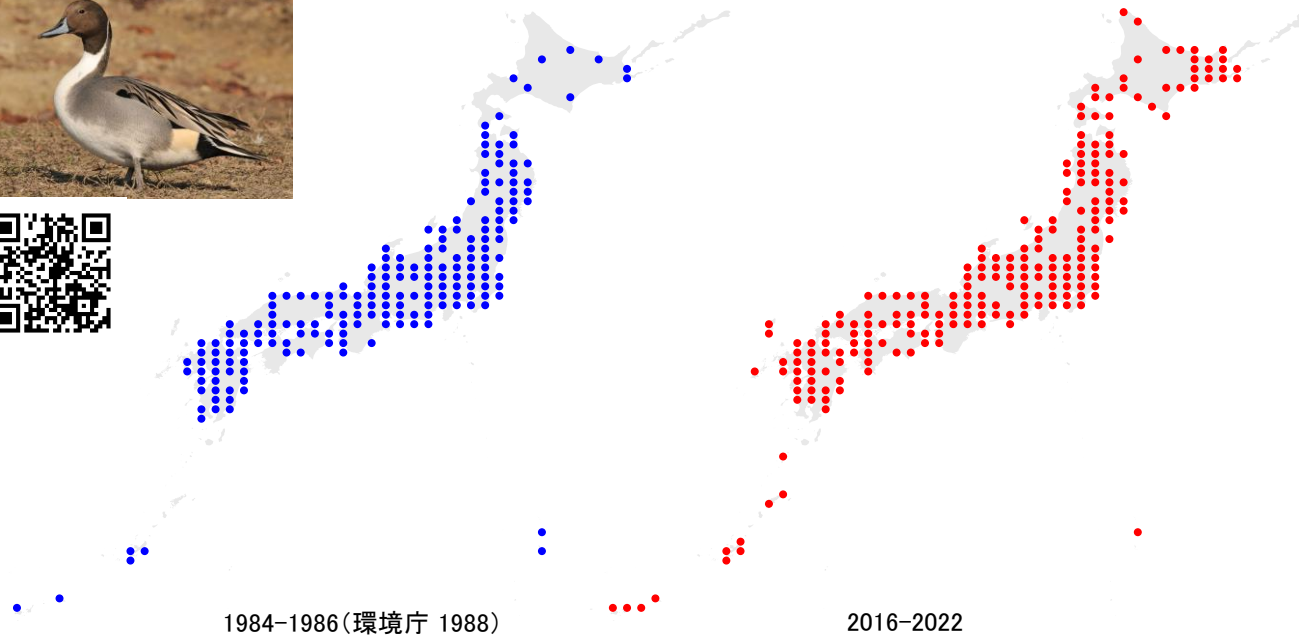
Eastern Spot-billed Duck *Anas zonorhyncha* Length: 51.5-64.5cm Weight: 750-1156g



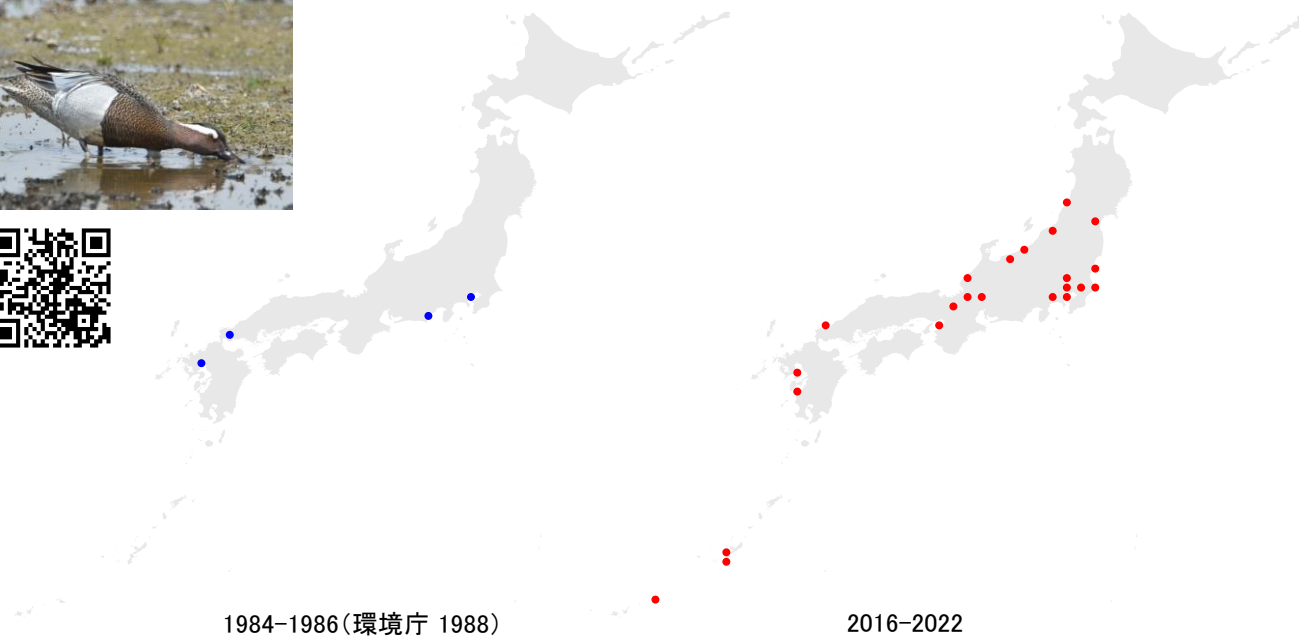
Northern Shoveler *Anas clypeata* Length: 43-56cm Weight: 410-1100g



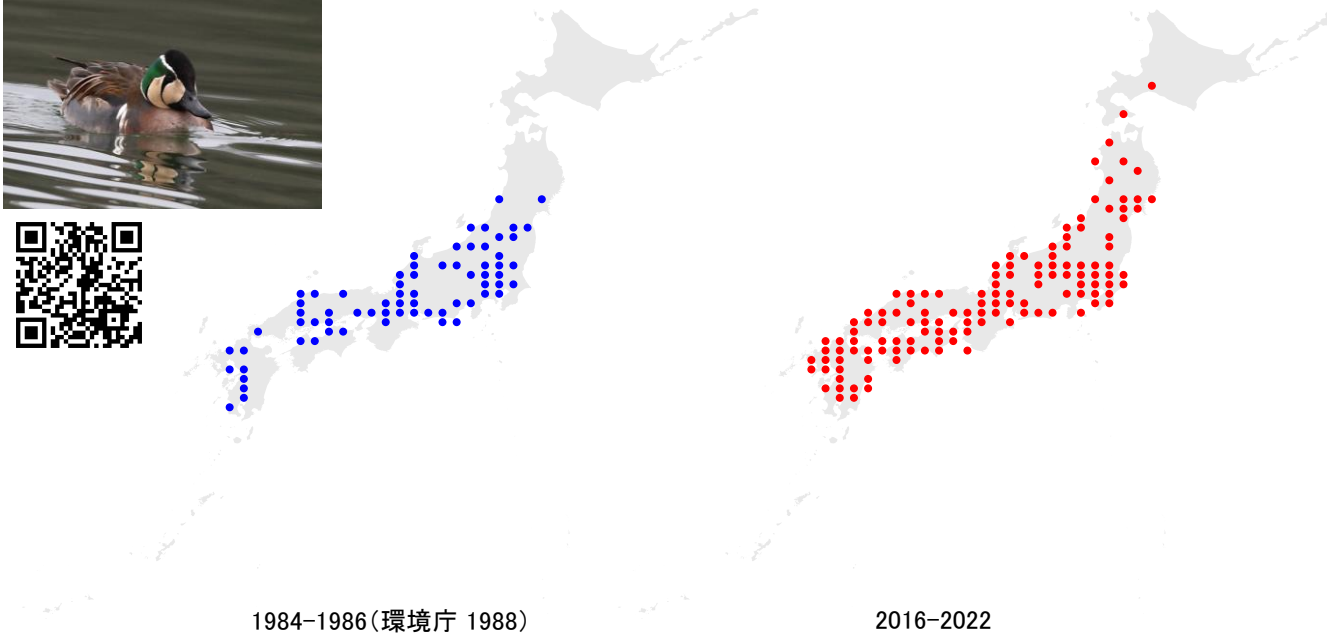
Northern Pintail *Anas acuta* Length: ♂57.7-73.0cm ♀51.0-58.1cm Weight: ♂765-1143g ♀630-982g



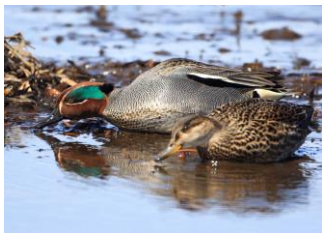
Garganey *Anas querquedula* Length: 38cm Weight: 220-520g

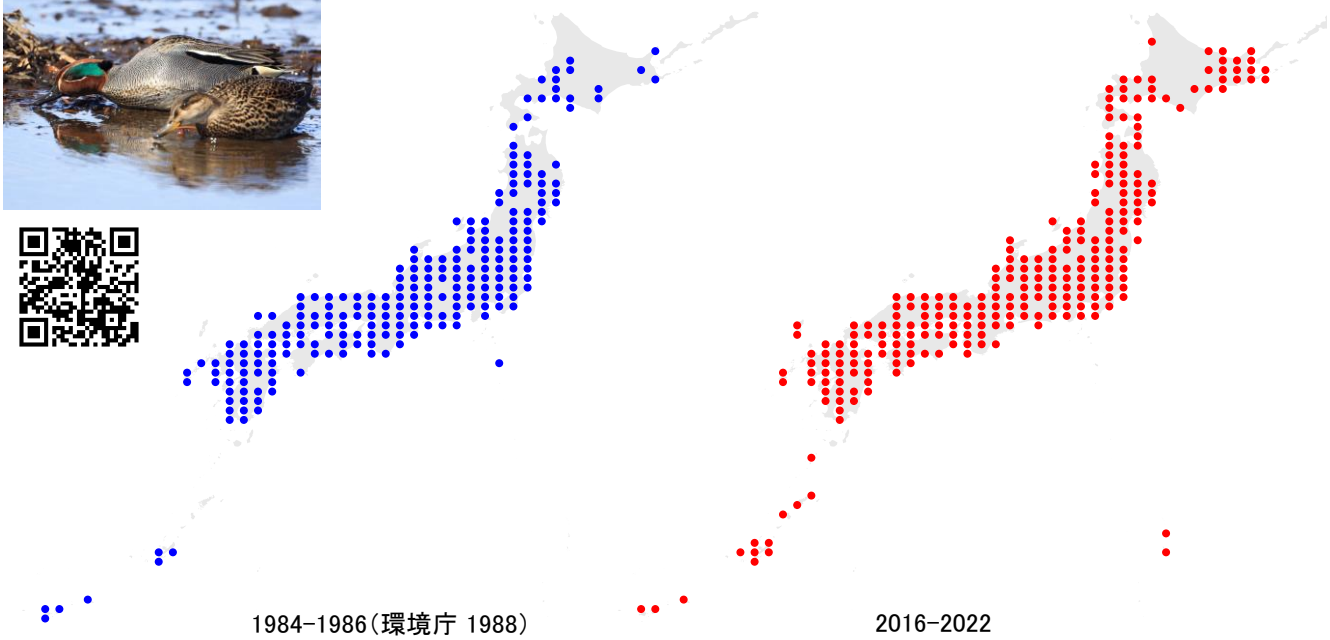


Baikal Teal *Anas formosa* Length：♂39.8-43.8cm ♀38.3-42.3cm Weight：♂375-551g ♀383-499g

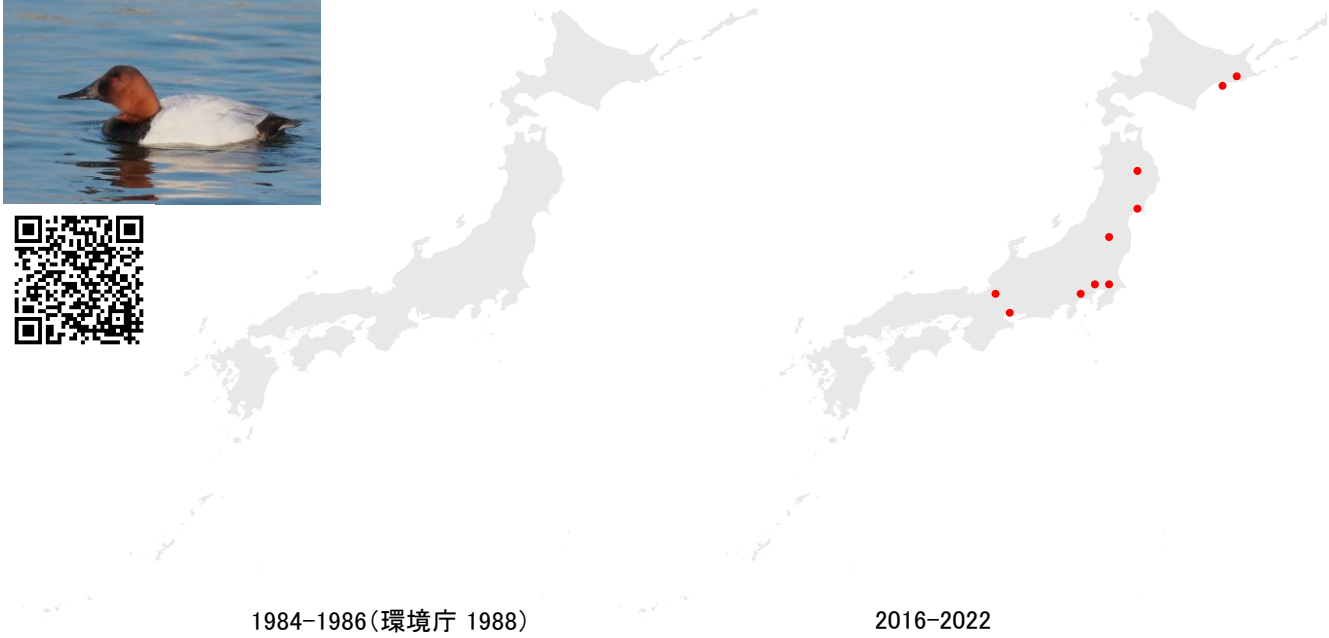


Eurasian Teal *Anas crecca* Length： 38cm Weight： 320-330g

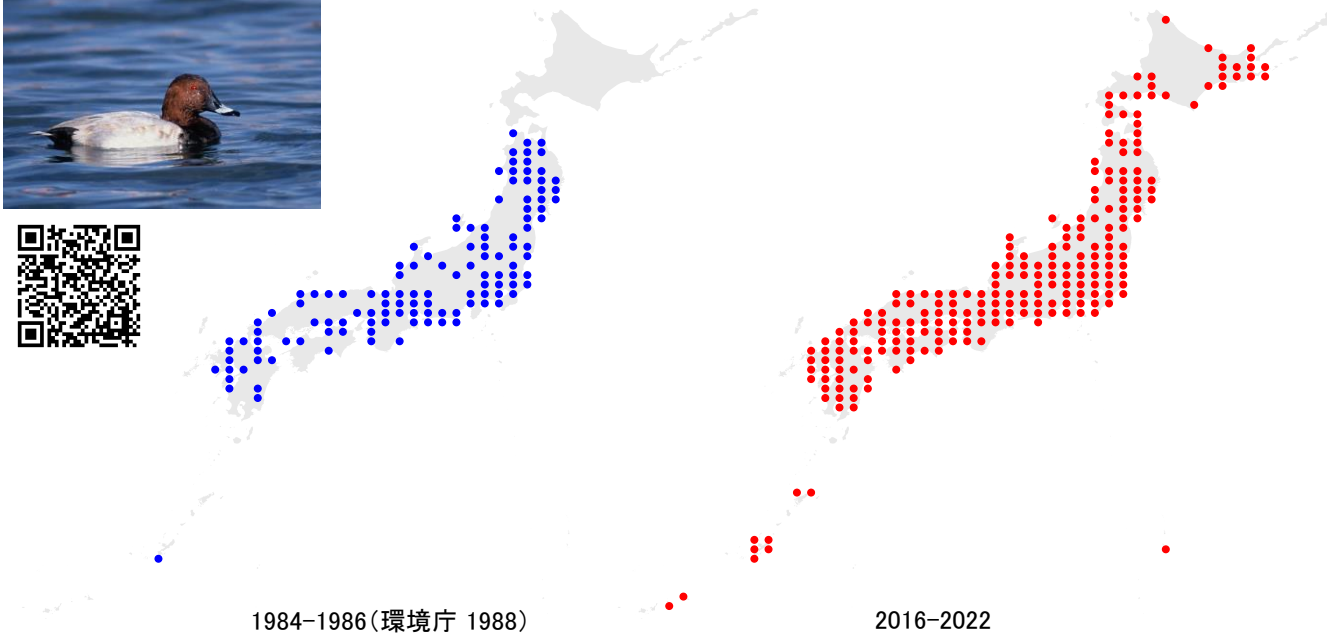




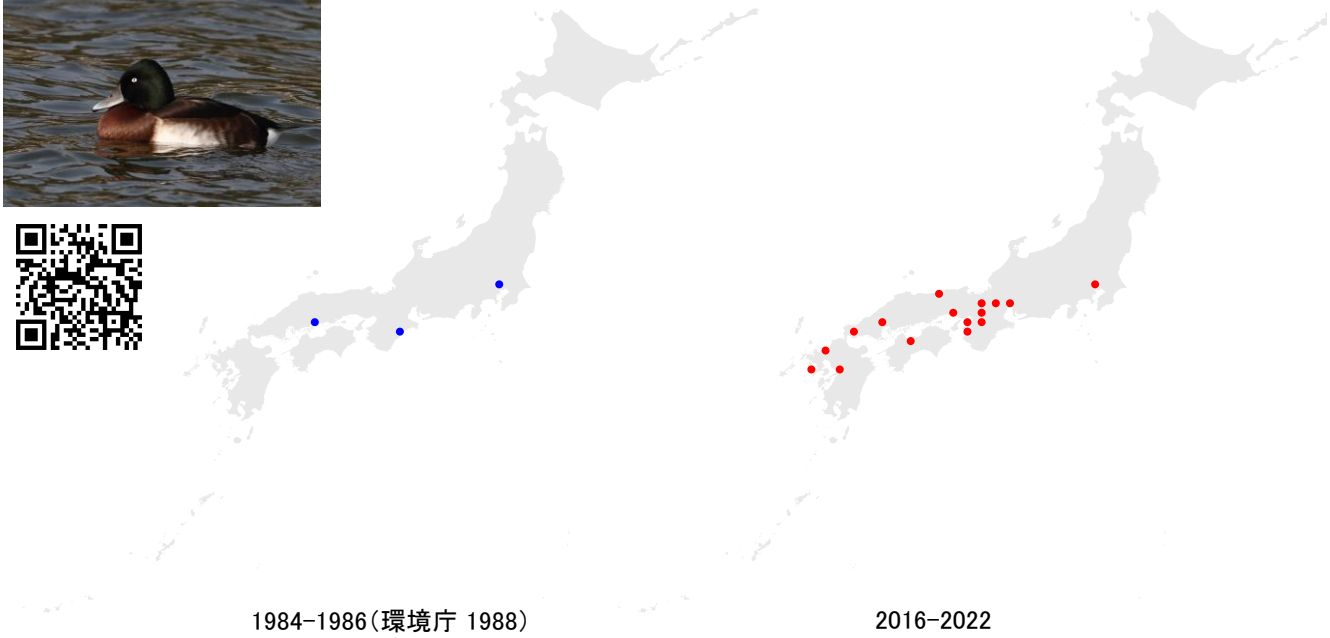
Canvasback *Aythya valisineria* Length: 48-61cm Weight: 1150-1250g



Common Pochard *Aythya ferina* Length: 43.0-48.3cm Weight: 180-250g

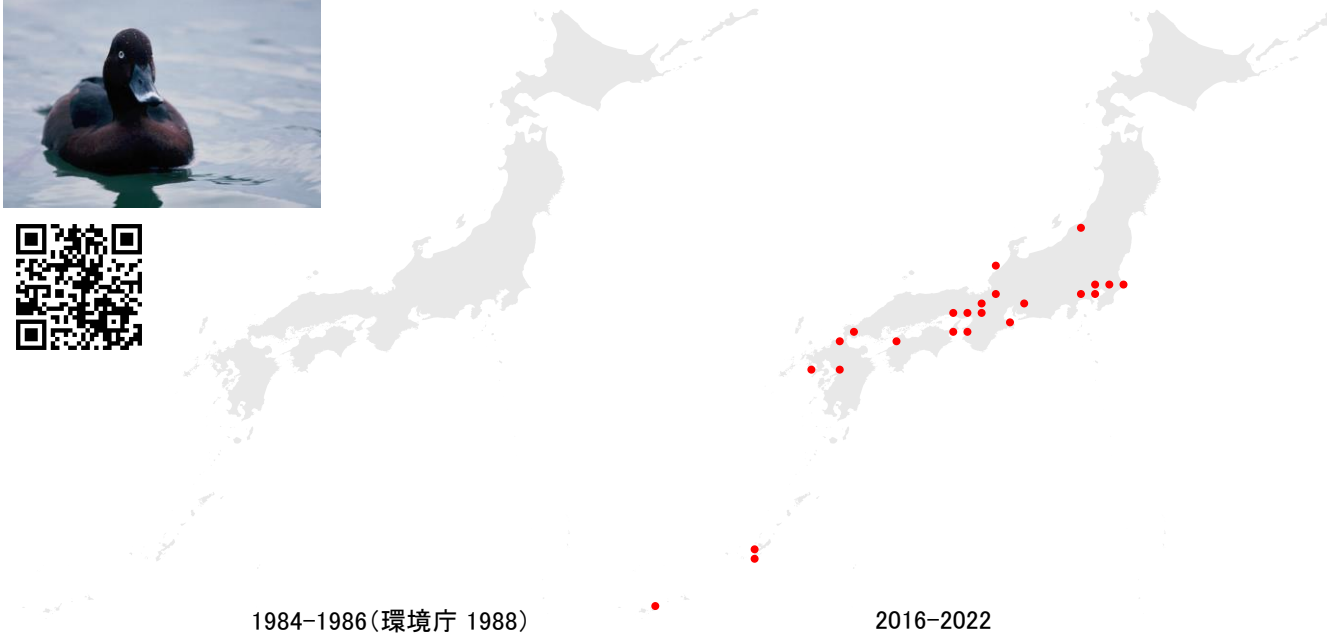


Baer's Pochard *Aythya baeri* Length: 46cm Weight: 680-880g



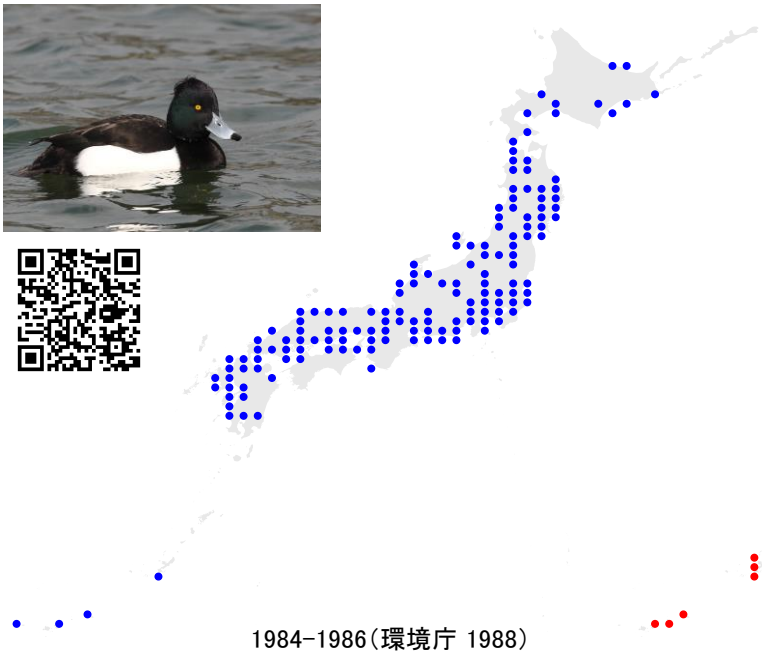
1984-1986(環境庁 1988) 2016-2022

Ferruginous Duck *Aythya nyroca* Length: 41cm Weight: 520-580g

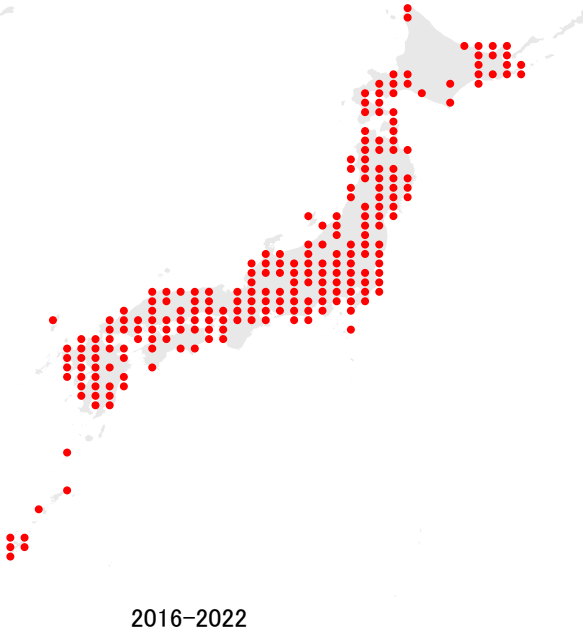


1984-1986(環境庁 1988) 2016-2022

Tufted Duck *Aythya fuligula* Length: 40-50cm Weight: 1000-1400g

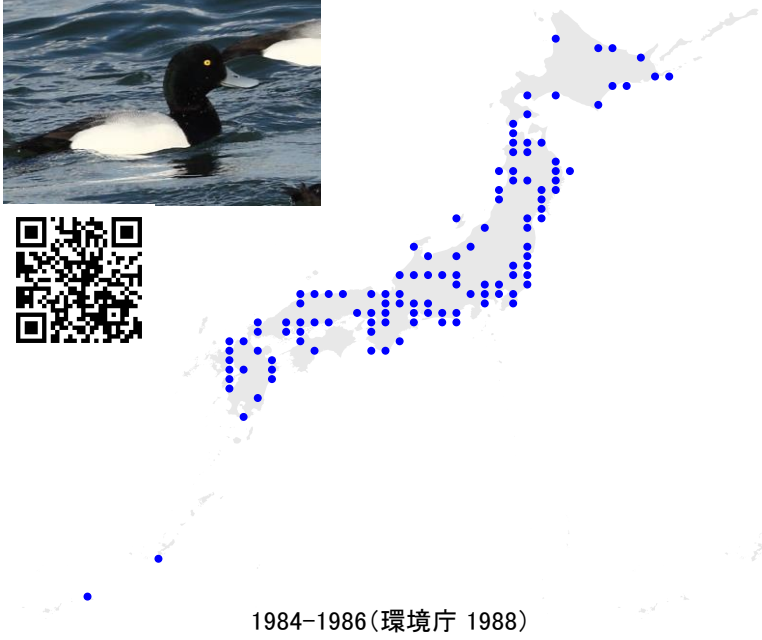


1984–1986（環境庁 1988）



2016–2022

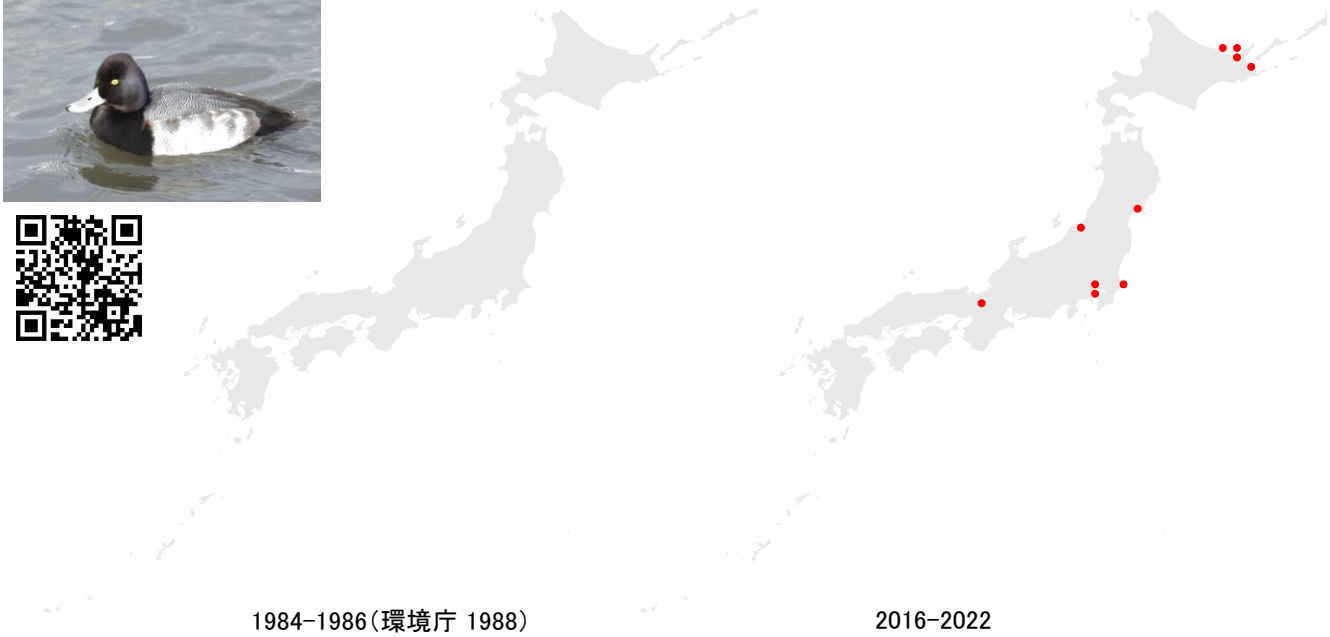
Greater Scaup *Aythya marila* Length: ♂43.5-46.5cm ♀40.0-45.5cm Weight: ♂744-1372g ♀690-1312g



1984–1986（環境庁 1988）

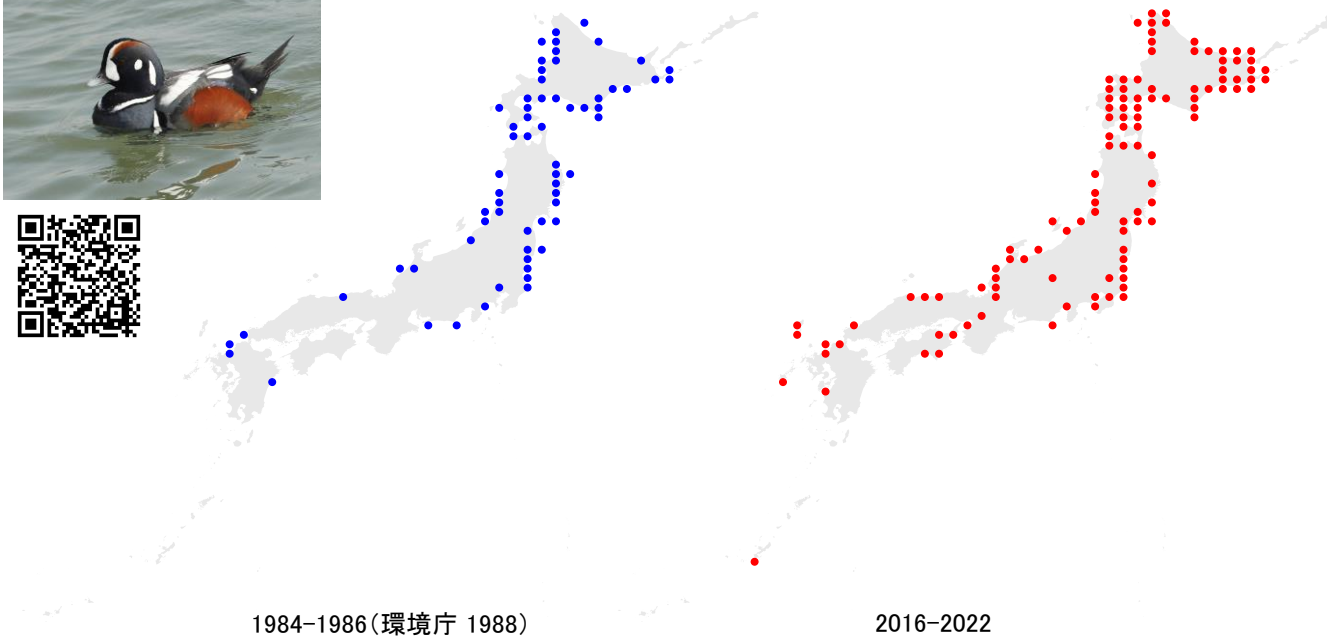
2016–2022

Lesser Scaup *Aythya affinis* Length: 38-48cm Weight: 800-850g



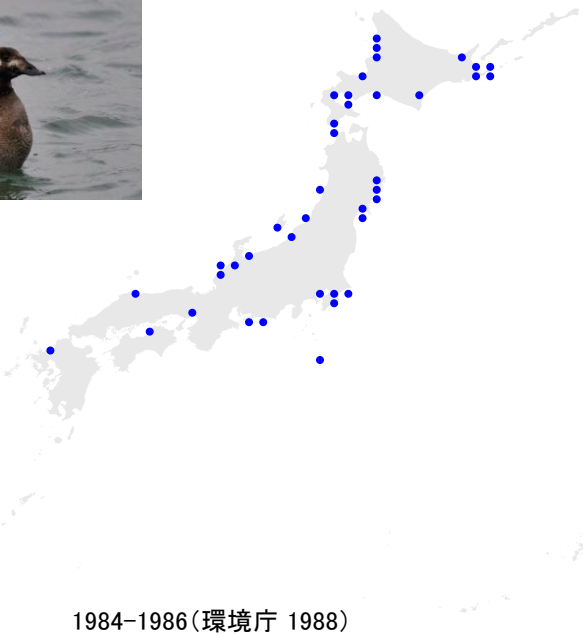
1984-1986（環境庁 1988） 2016-2022

Harlequin Duck *Histrionicus histrionicus* Length: 38-51cm Weight: 540-680g

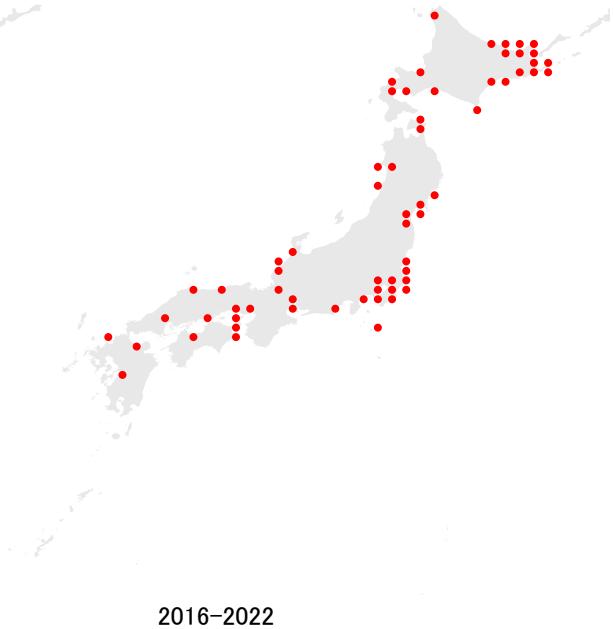


1984-1986（環境庁 1988） 2016-2022

White-winged Scoter *Melanitta fusca* Length: 50cm Weight: 1200-1700g



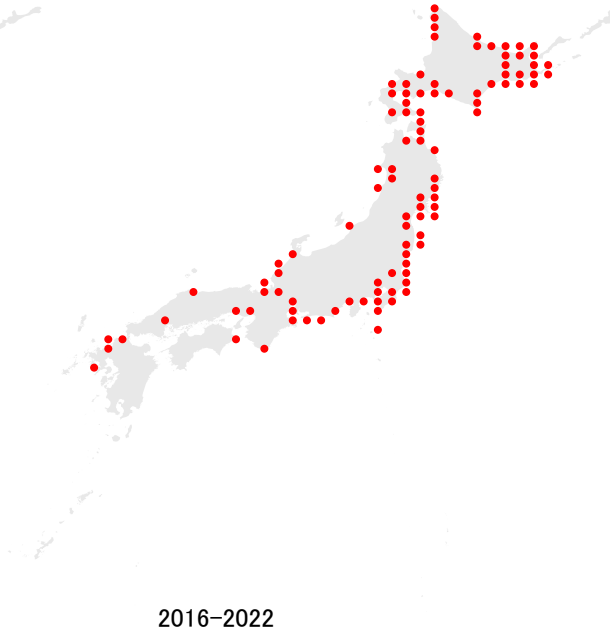
1984-1986（環境庁 1988）



2016-2022

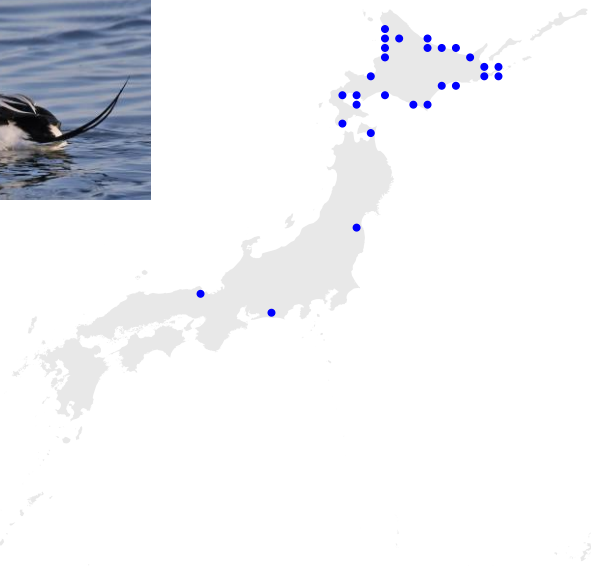
Black Scoter *Melanitta americana* Length: 50cm Weight: 950-1268g

1984-1986（環境庁 1988）

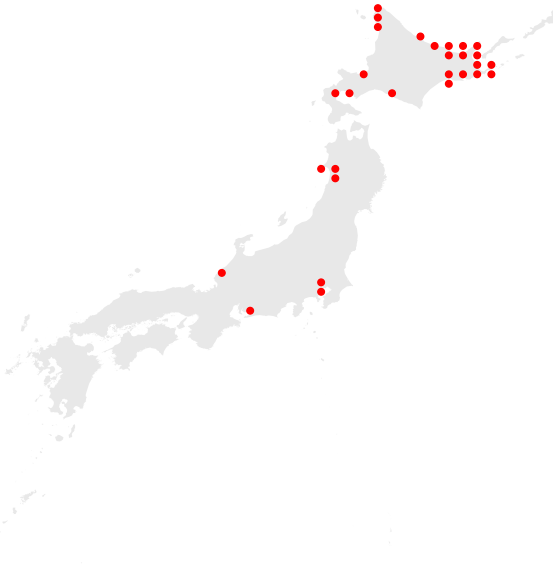


2016-2022

Long-tailed Duck *Clangula hyemalis* Length: 38-58cm Weight: 650-800g

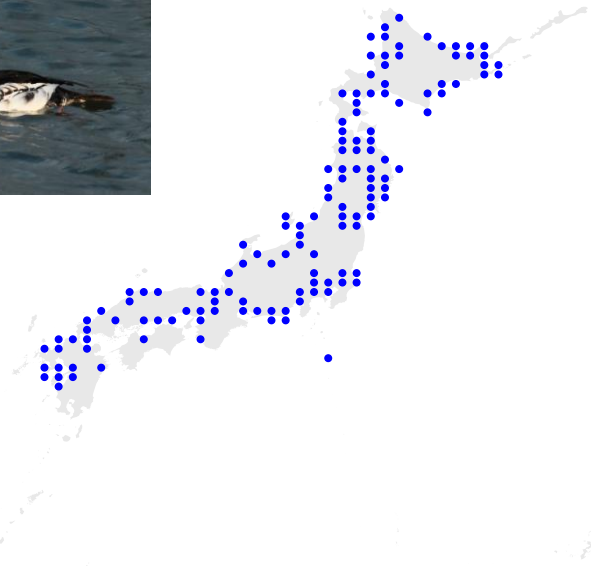


1984-1986(環境庁 1988)

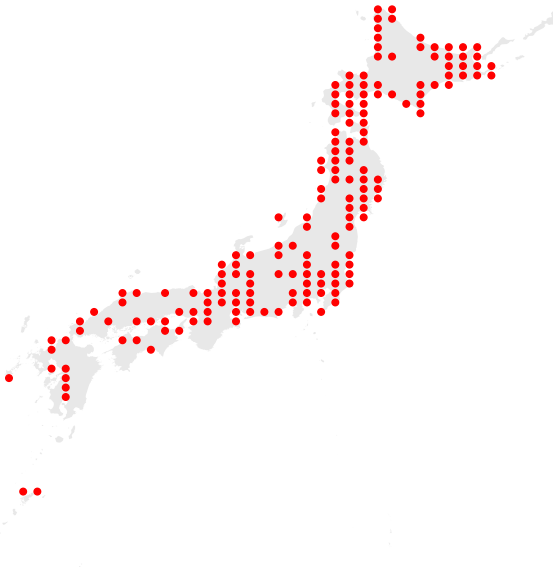


2016-2022

Common Goldeneye *Bucephala clangula* Length: 40-51cm Weight: 710-1200g

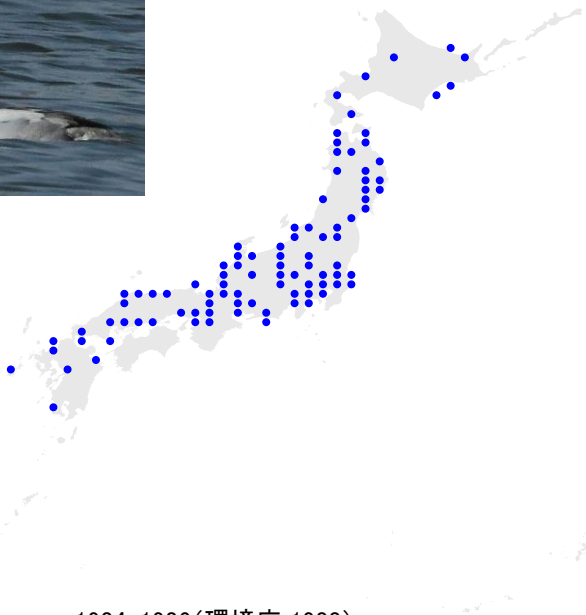


1984-1986(環境庁 1988)



2016-2022

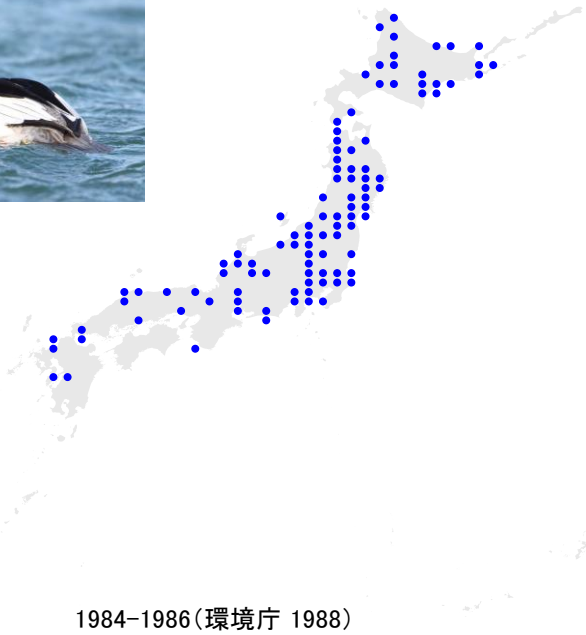
Smew *Mergellus albellus* Length: 35-40cm Weight: 515-935g



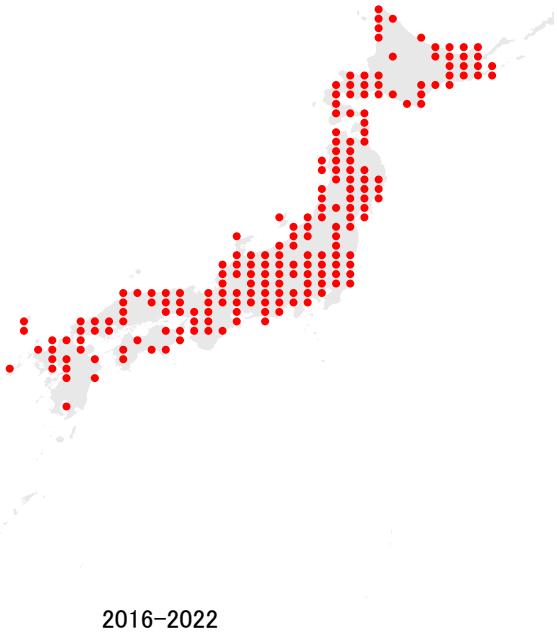
1984-1986（環境庁 1988）

2016-2022

Common Merganser *Mergus merganser* Length: 51-68cm Weight: 1500-1700g

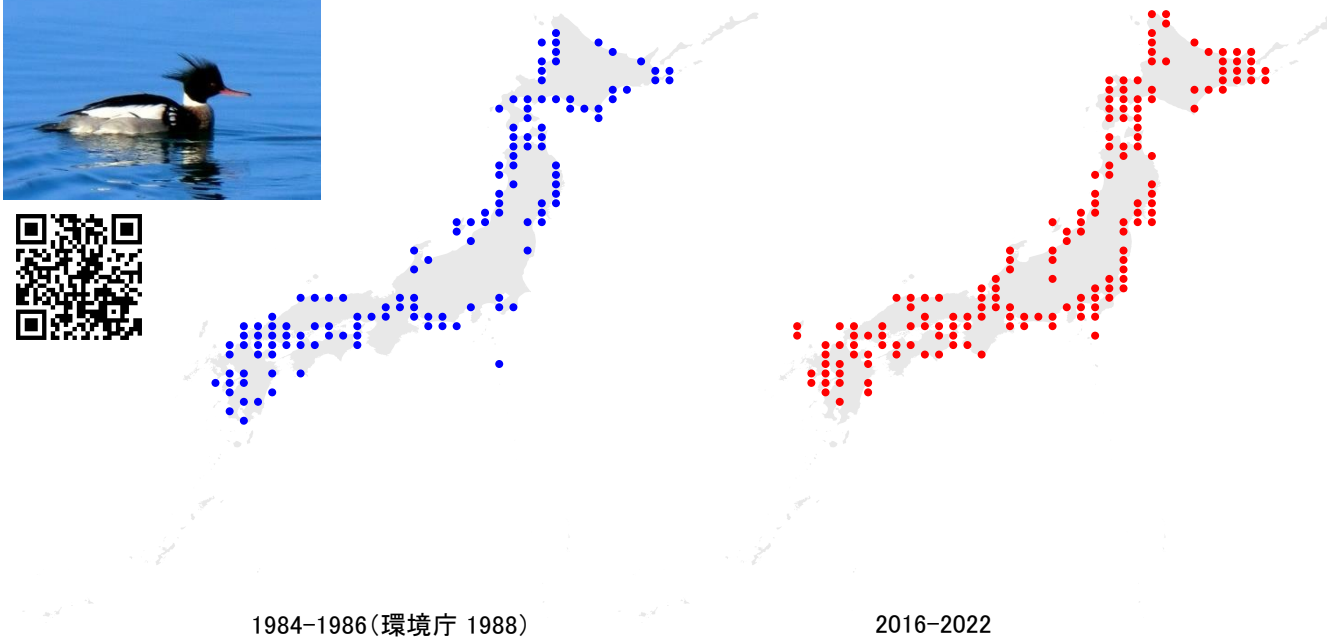


1984-1986（環境庁 1988）



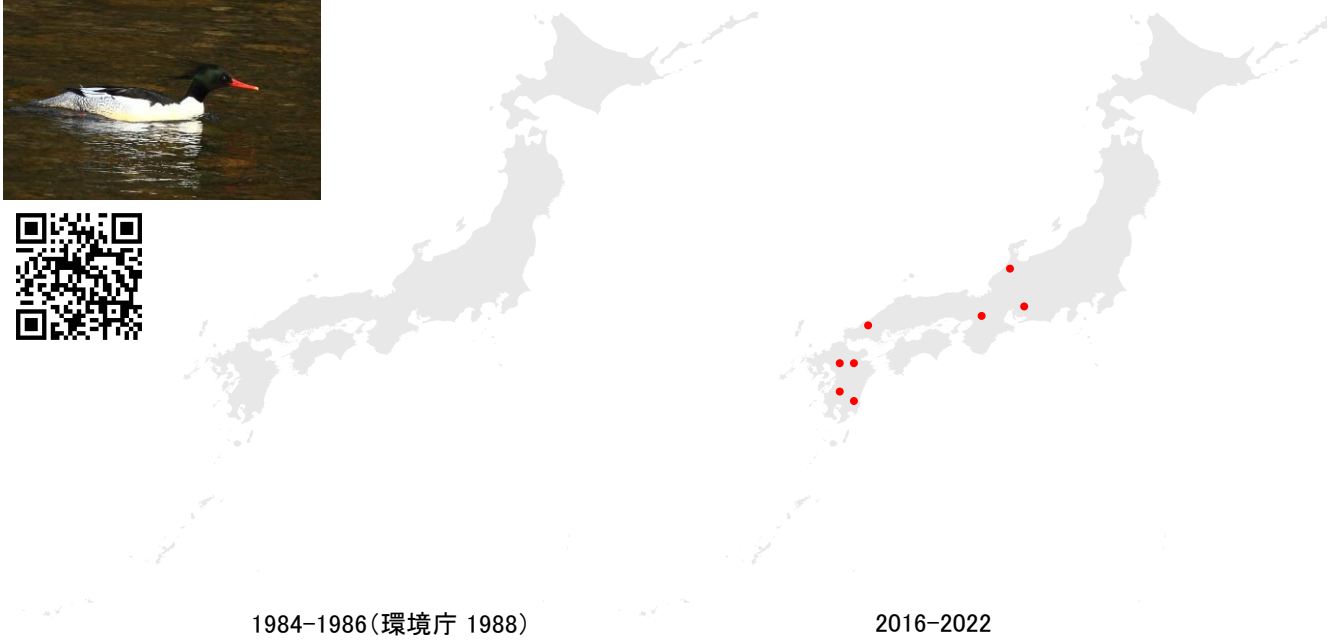
2016-2022

Red-breasted Merganser *Mergus serrator* Length： 48-66cm Weight： 900-1200g



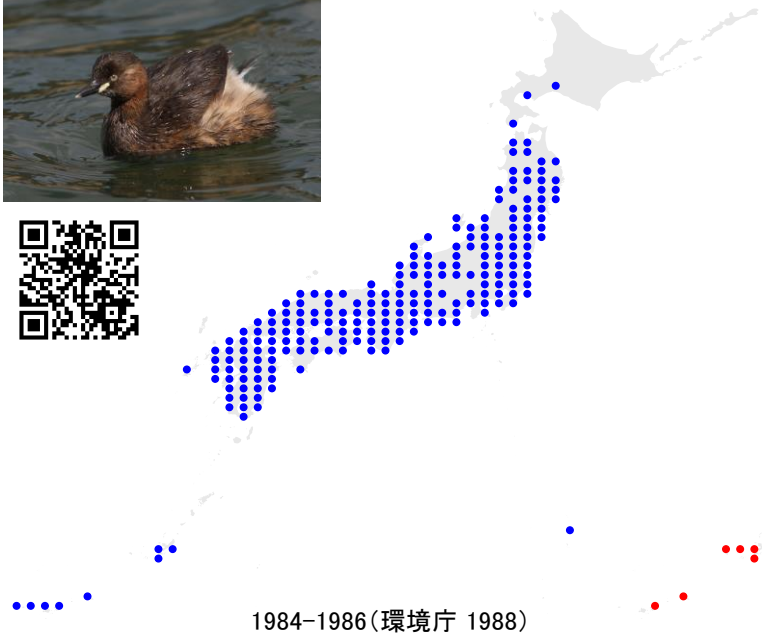
1984-1986（環境庁 1988） 2016-2022

Scaly-sided Merganser *Mergus squamatus* Length： 55cm

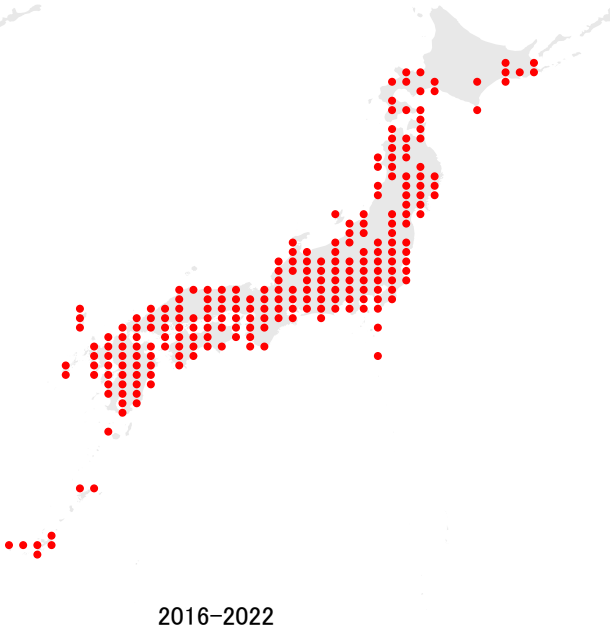


1984-1986（環境庁 1988） 2016-2022

Little Grebe *Tachybaptus ruficollis* Length: 26-33cm Weight: 160-214g

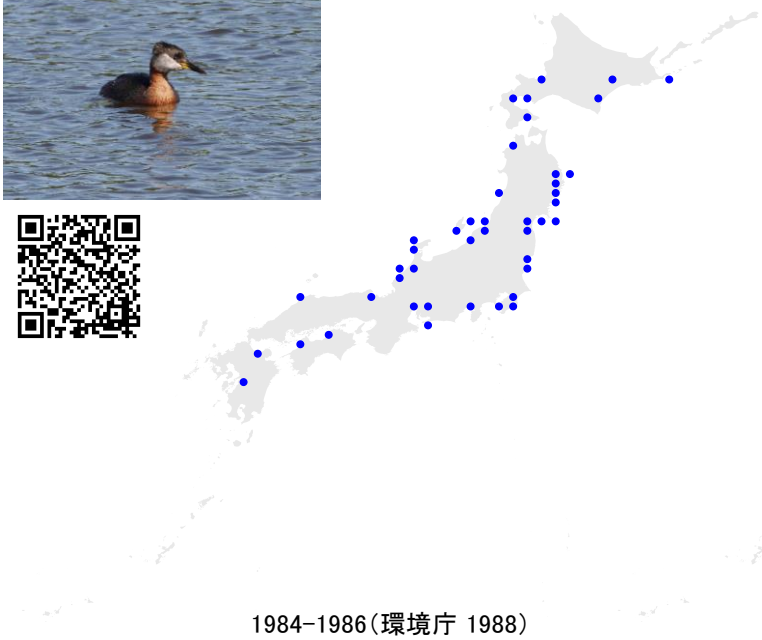


1984-1986（環境庁 1988）

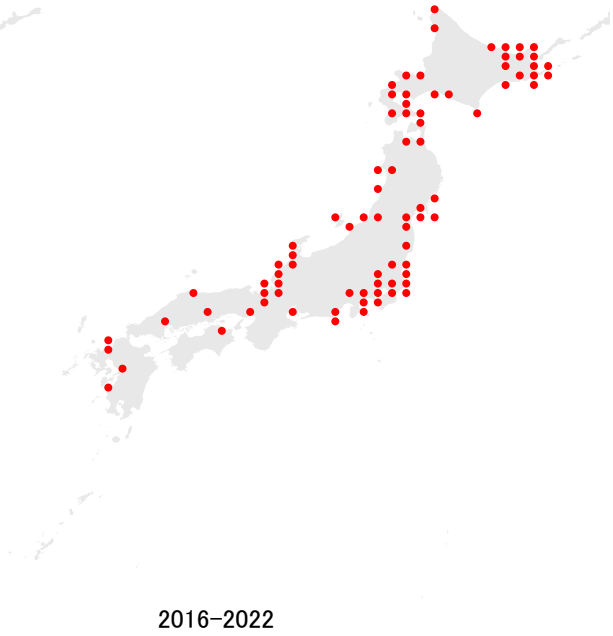


2016-2022

Red-necked Grebe *Podiceps grisegena* Length: 40-50cm Weight: 806-925g

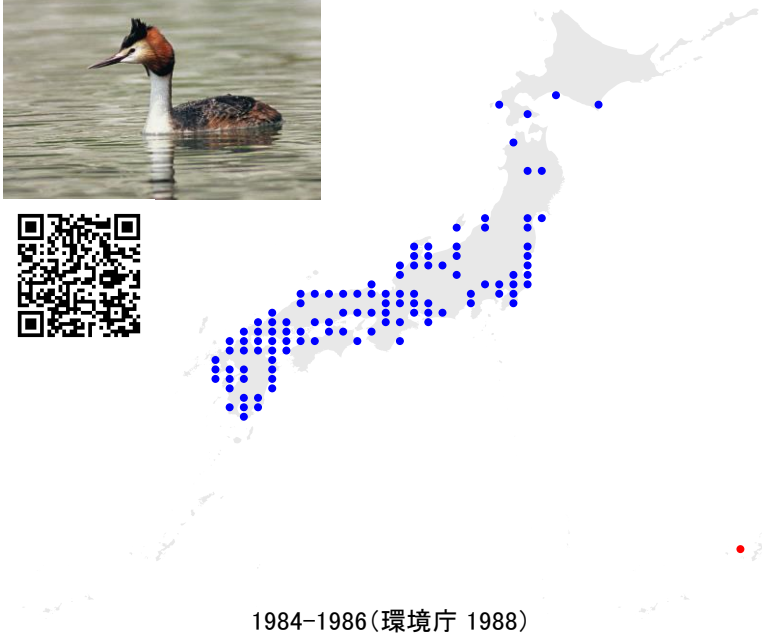


1984-1986（環境庁 1988）

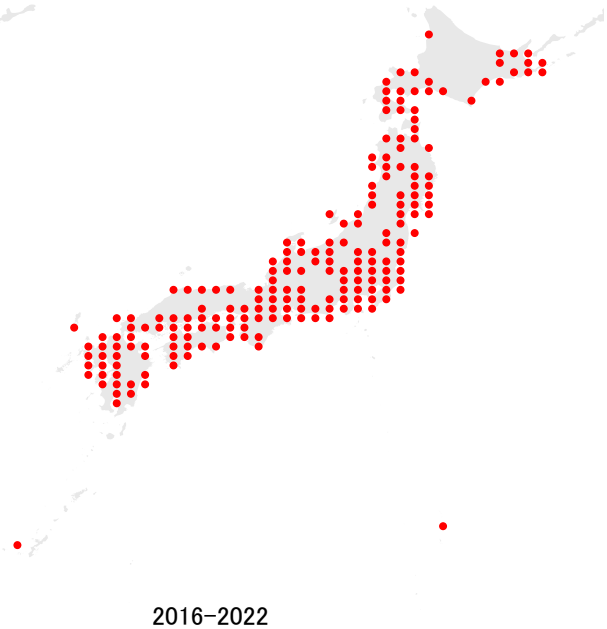


2016-2022

Great Crested Grebe *Podiceps cristatus* Length: 46-51cm Weight: ♂596-1490g ♀568-1380g

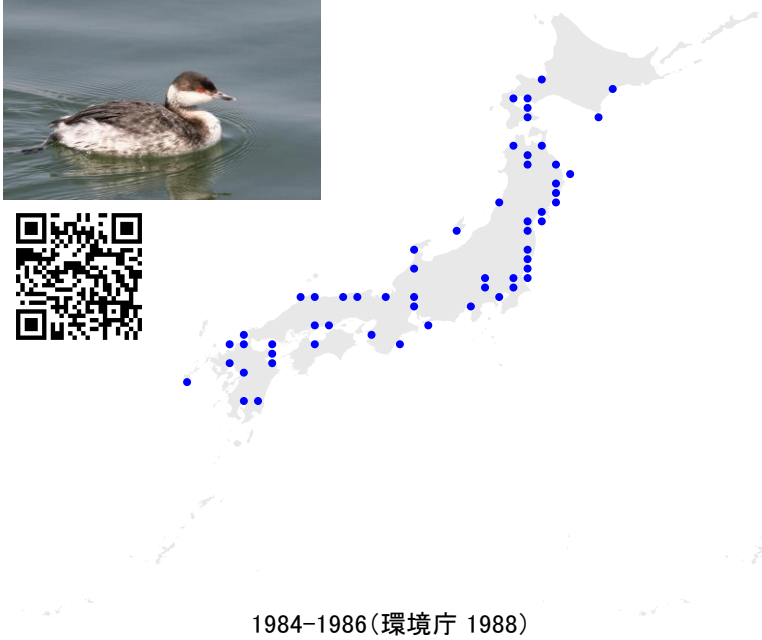


1984-1986（環境庁 1988）

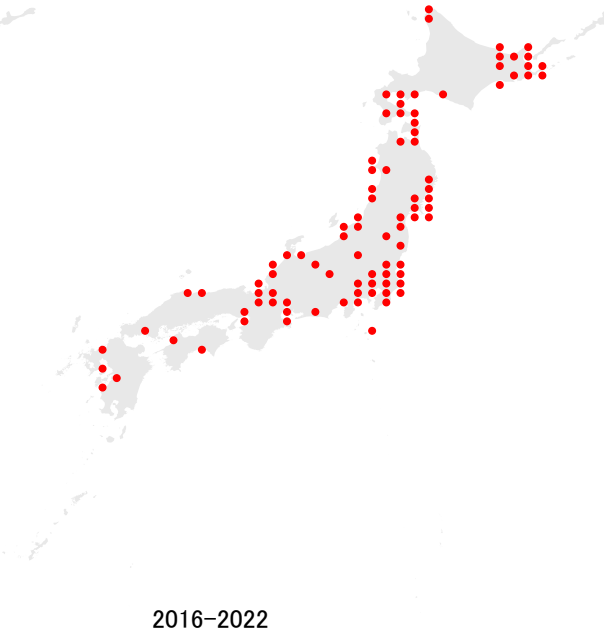


2016-2022

Horned Grebe *Podiceps auritus* Length: 31-38cm Weight: 300-470g

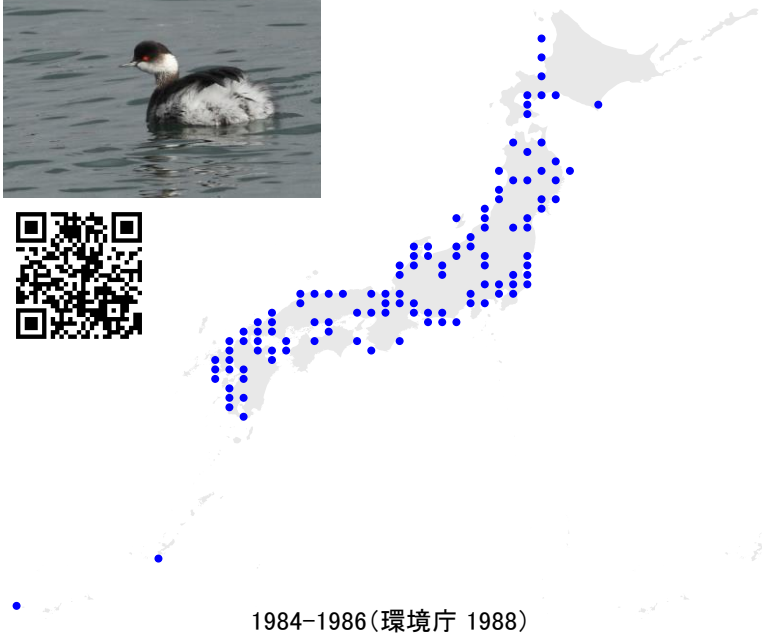


1984-1986（環境庁 1988）

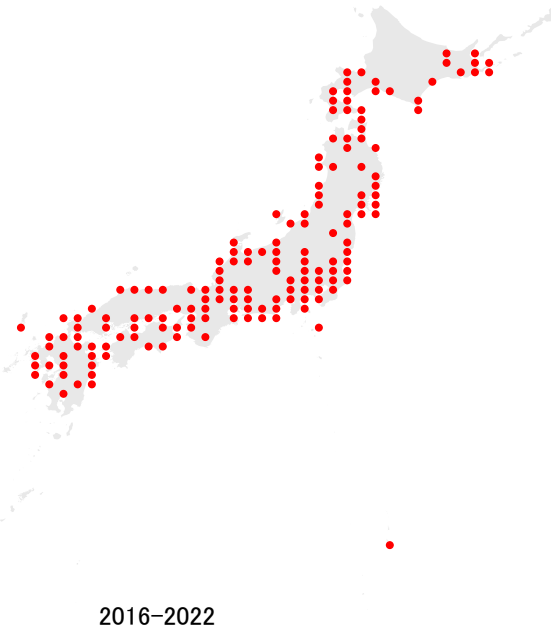


2016-2022

Black-necked Grebe *Podiceps nigricollis* Length: 28-34cm Weight: 265-450g

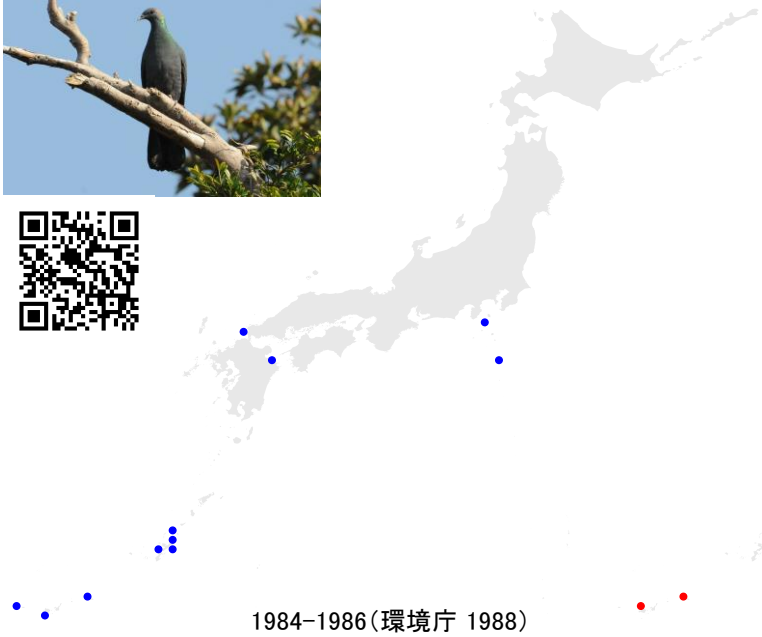


1984–1986（環境庁 1988）

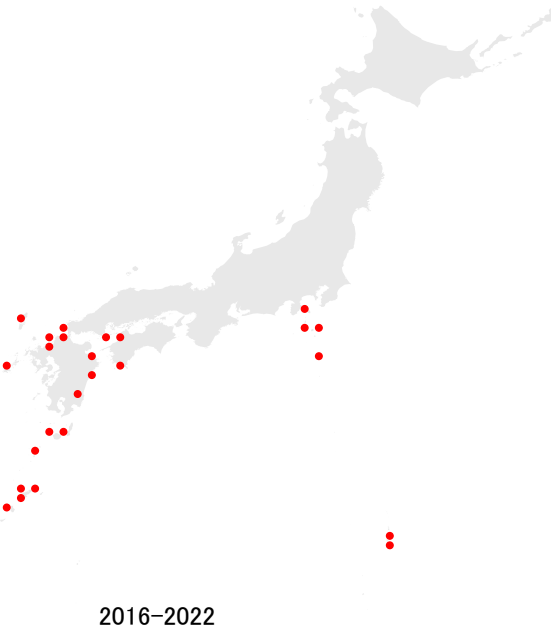


2016–2022

Japanese Wood Pigeon *Columba janthina* Length: 37-43.5cm Weight: 500g

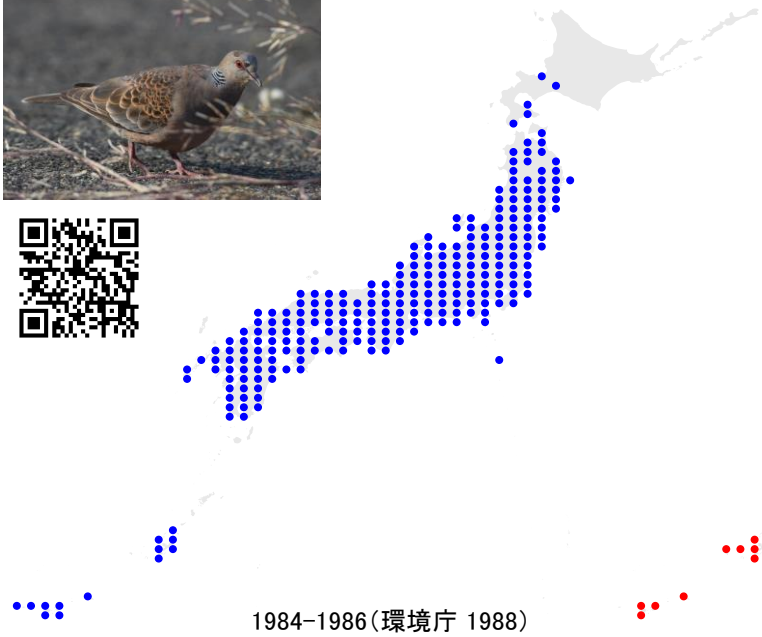


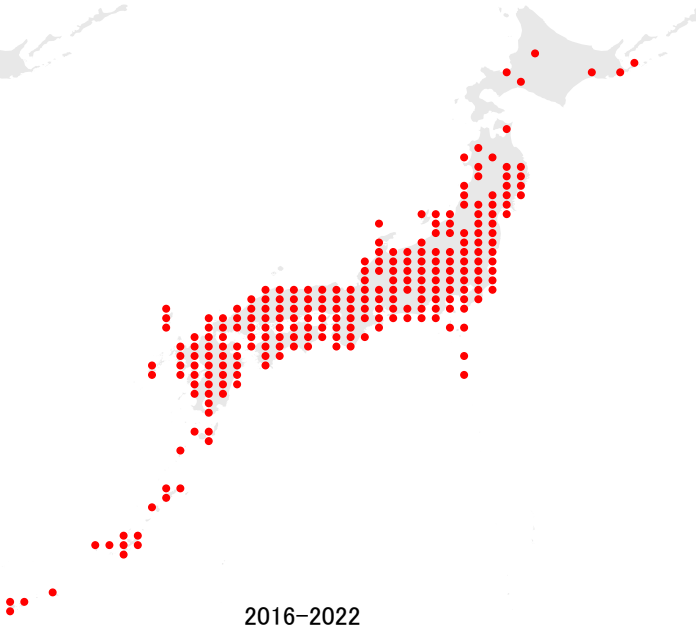
1984–1986（環境庁 1988）



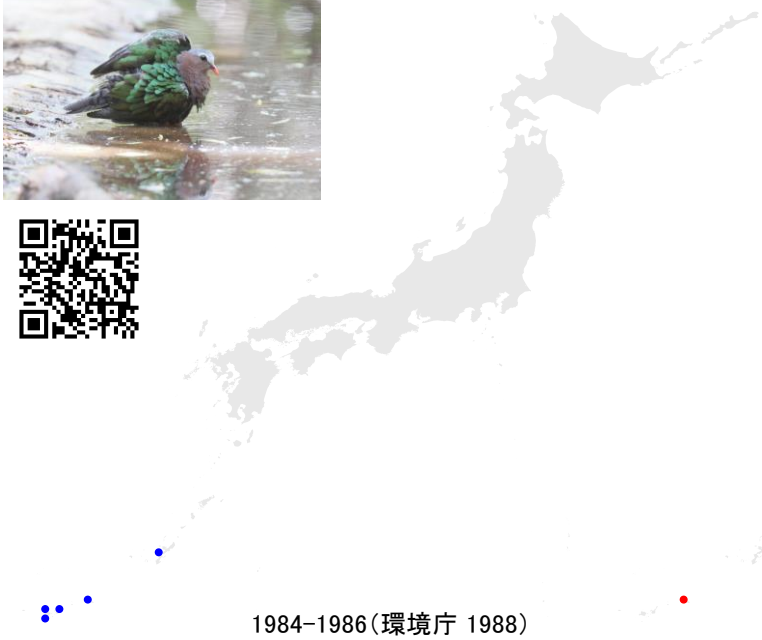
2016–2022

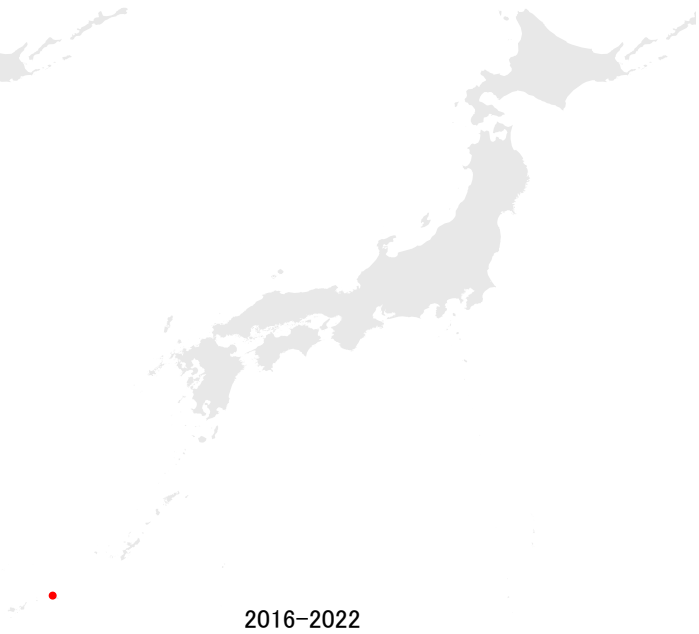
Oriental Turtle Dove *Streptopelia orientalis* Length: 33-35cm Weight: 165-274g



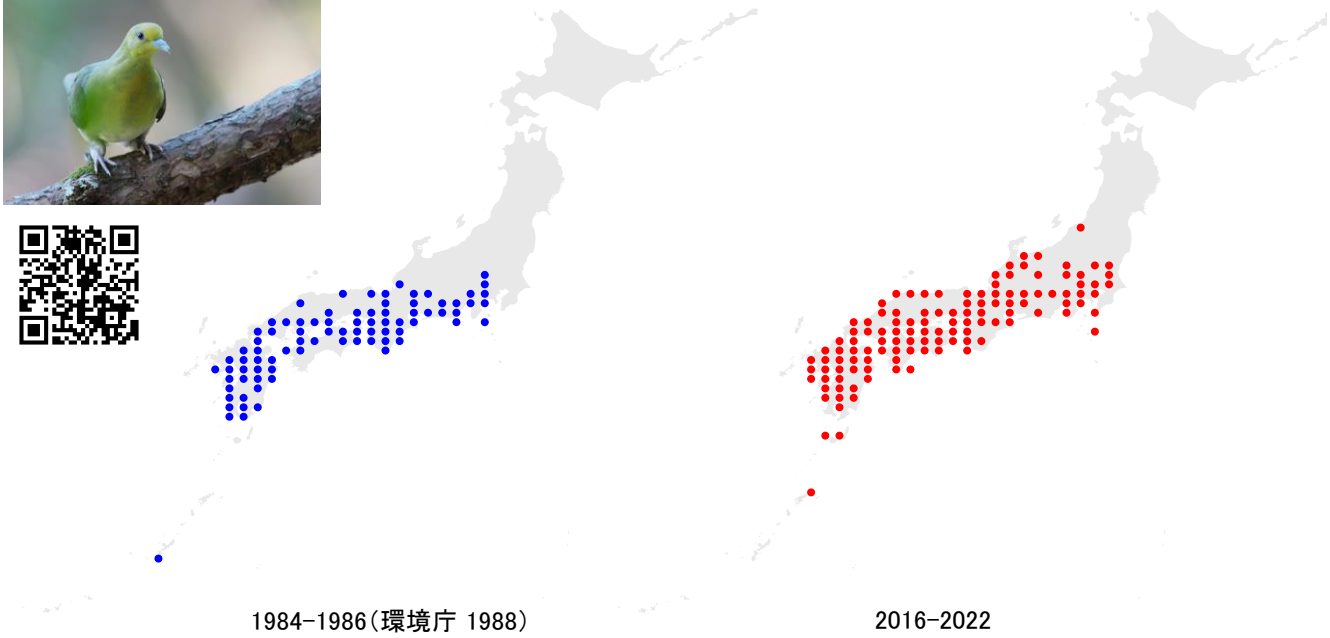


Common Emerald Dove *Chalcophaps indica* Length: 25cm Weight: 110-130g

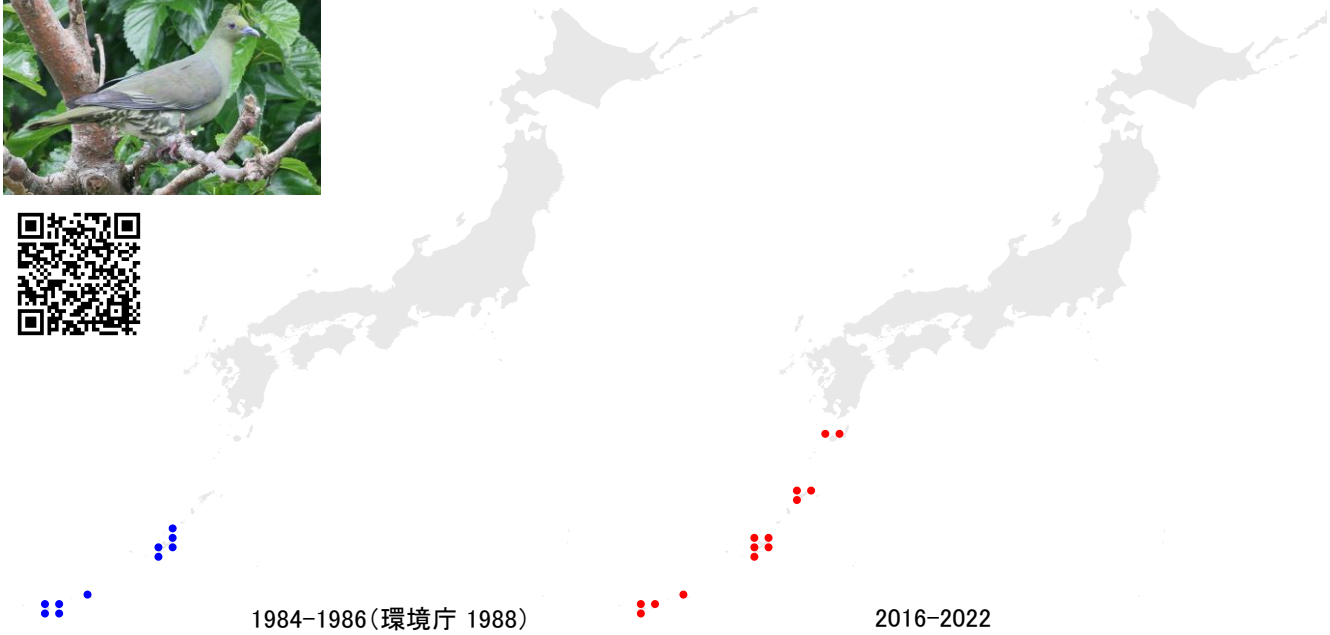




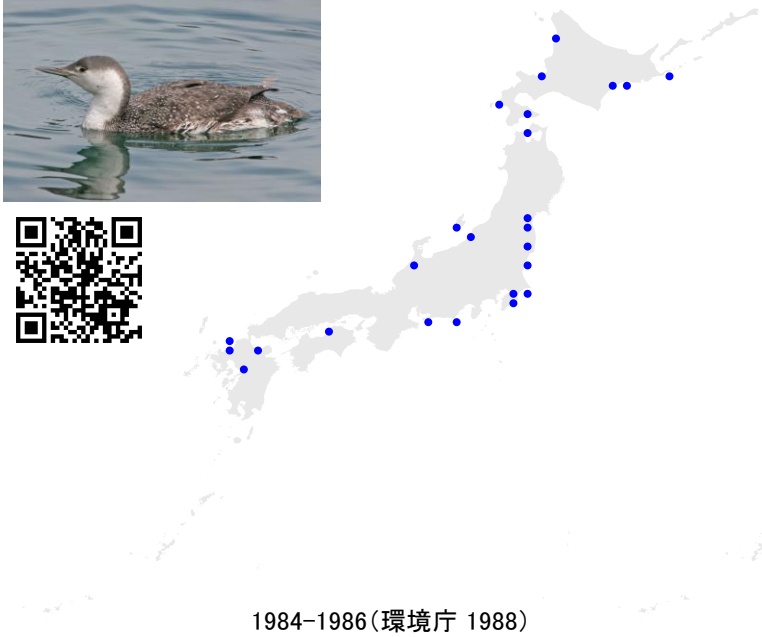
White-bellied Green Pigeon *Treron sieboldii* Length: 31.5-34.8cm Weight: 217-300g



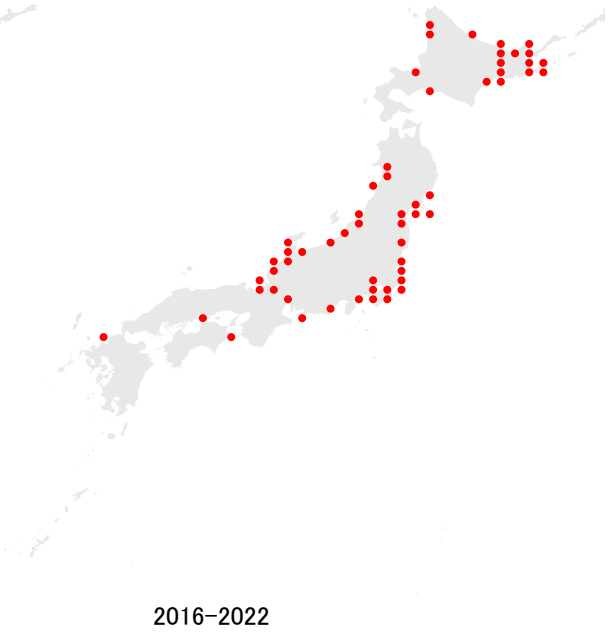
Whistling Green Pigeon *Treron formosae* Length: 35cm Weight: 250-270g



Red-throated Loon *Gavia stellata* Length: 59.8-63.8cm Weight: 1314.4-1857.8g

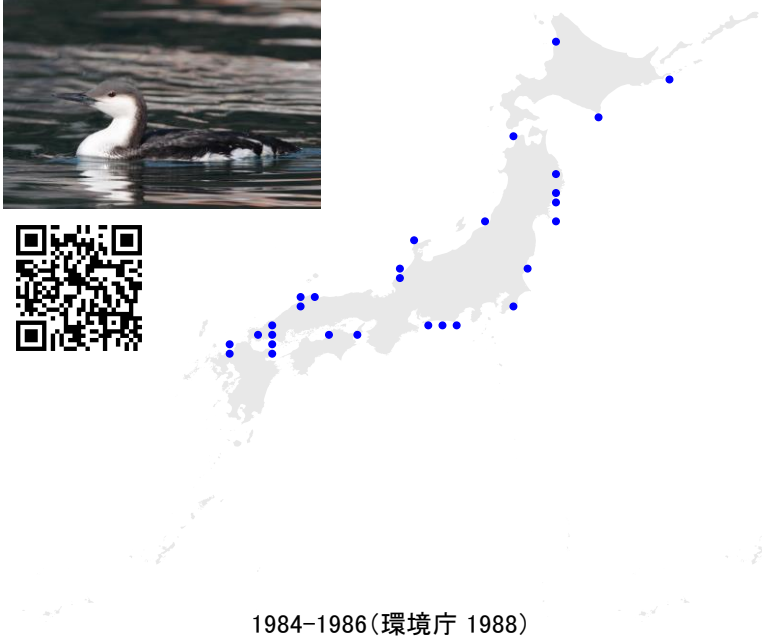


1984-1986（環境庁 1988）

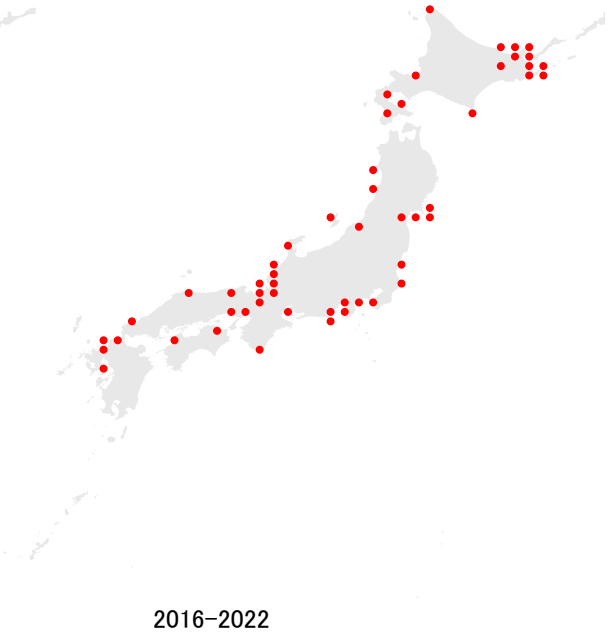


2016-2022

Black-throated Loon *Gavia arctica* Length: 68-74cm Weight: 1951.5-2820.4g

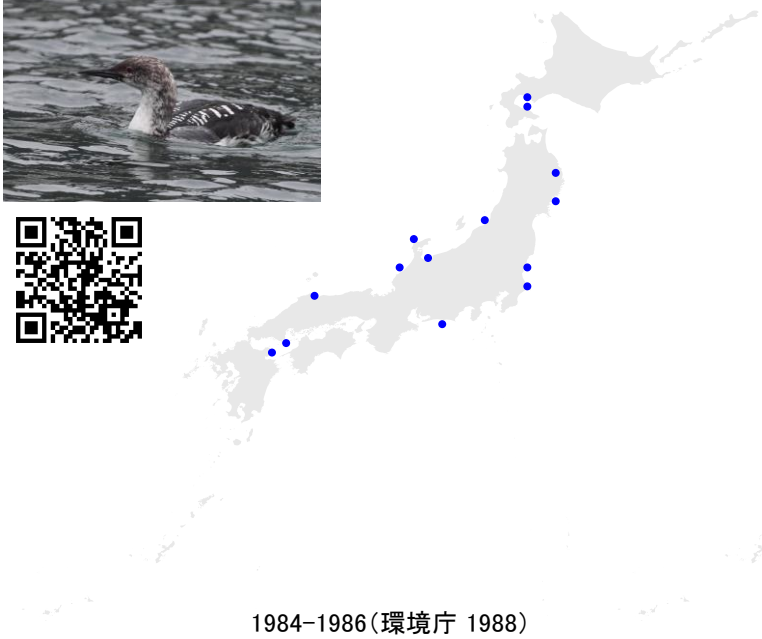


1984-1986（環境庁 1988）

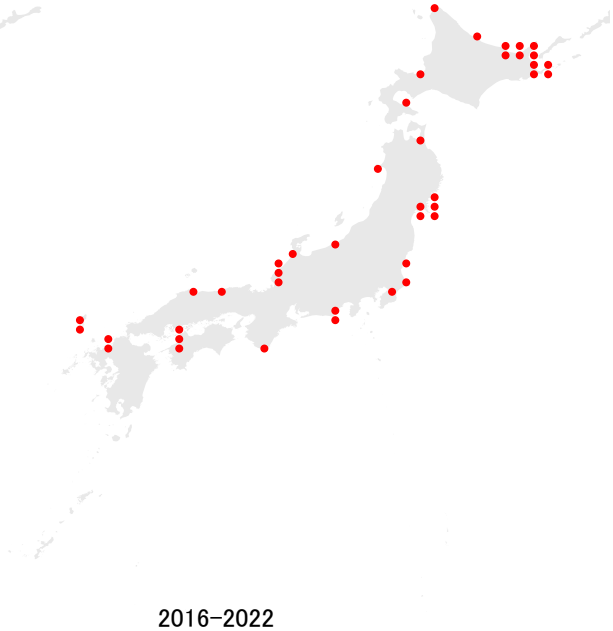


2016-2022

Pacific Loon *Gavia pacifica* Length: 62.1 66.9cm Weight: 1476.8-2167.5g



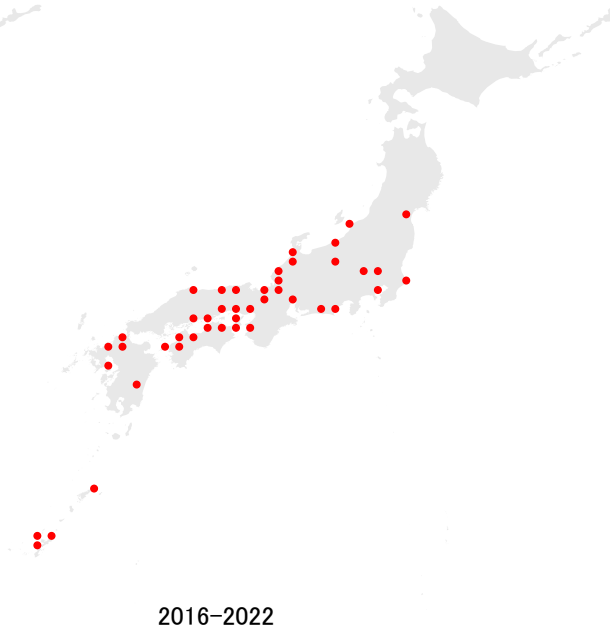
1984-1986（環境庁 1988）



2016-2022

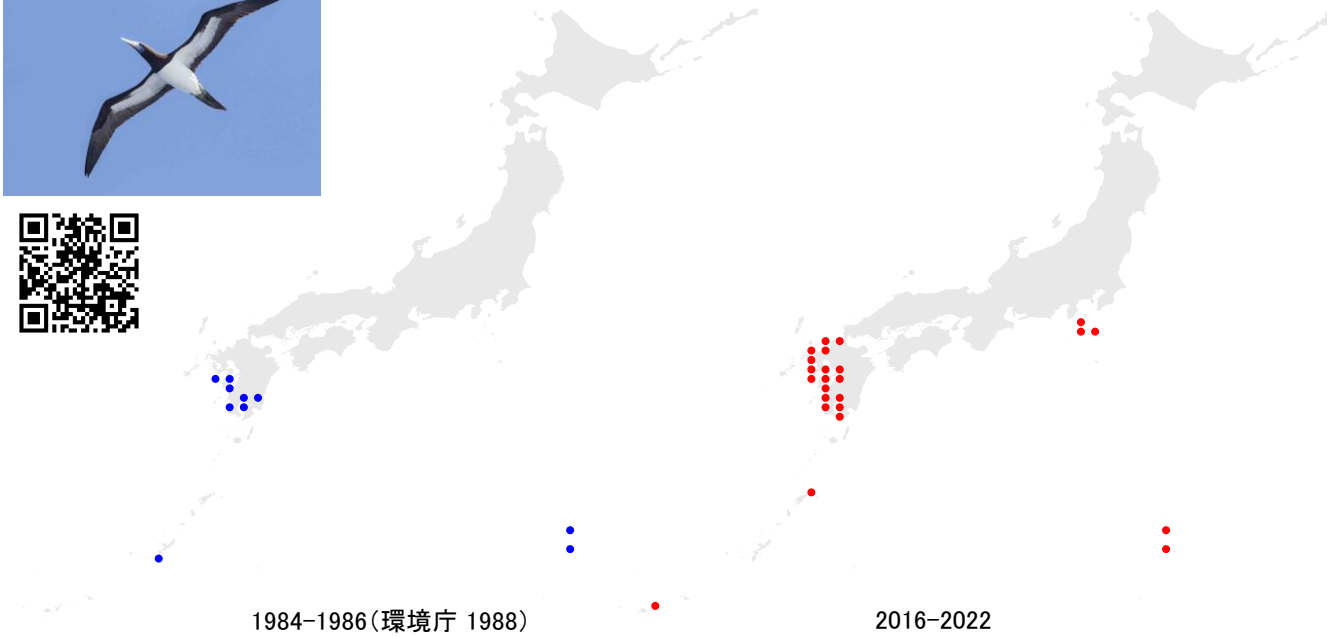
Oriental Stork *Ciconia boyciana* Length: 110-115cm Weight: 5000g

1984-1986（環境庁 1988）

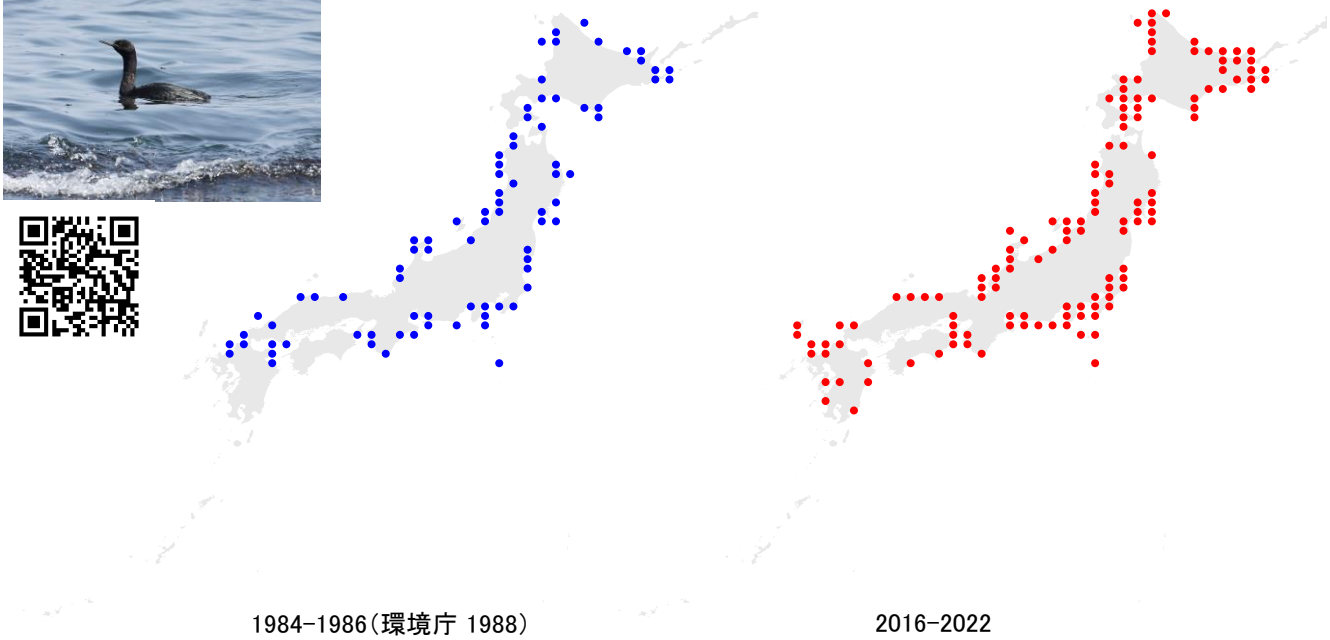


2016-2022

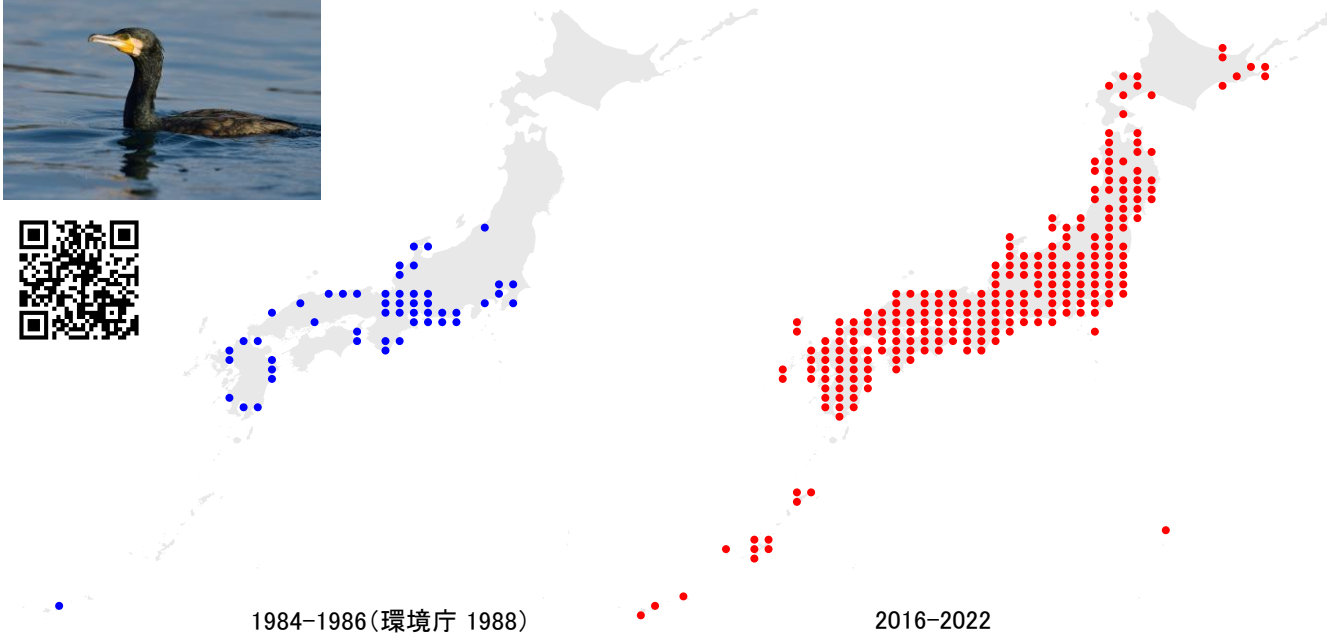
Brown Booby *Sula leucogaster* Length: ♂73-80cm ♀ 76-83cm Weight: ♂850-1190g ♀970-1480g



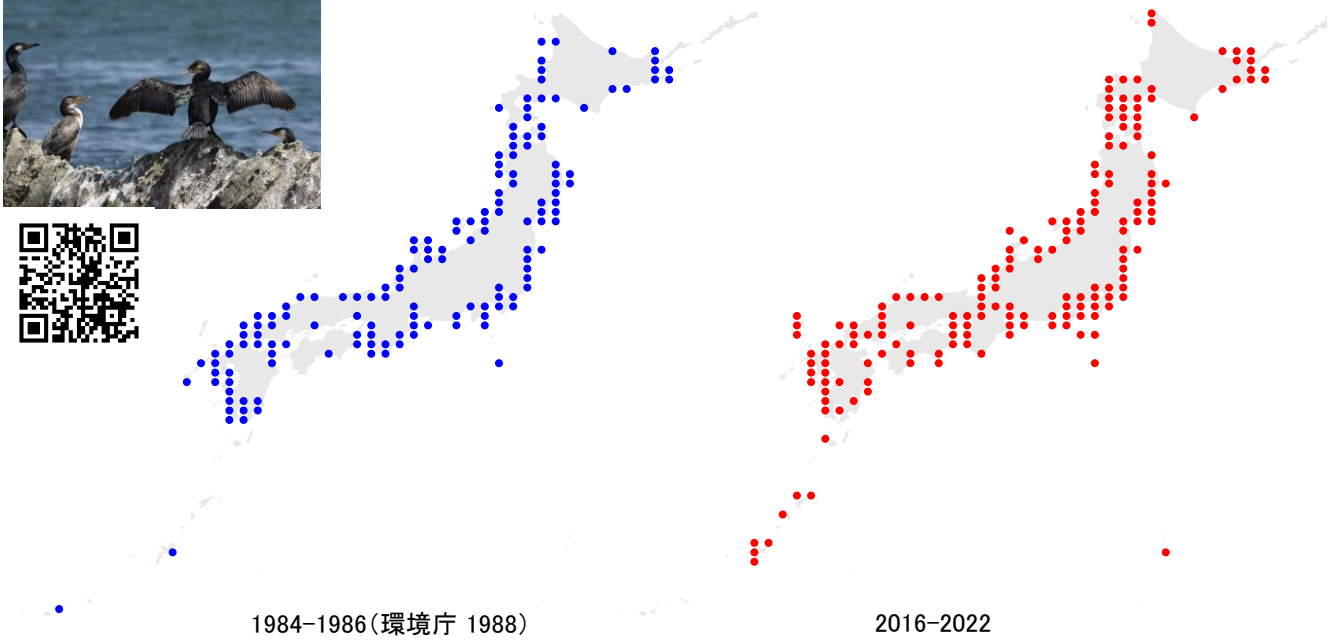
Pelagic Cormorant *Phalacrocorax pelagicus* Length: 73cm Weight: 1200-2000g



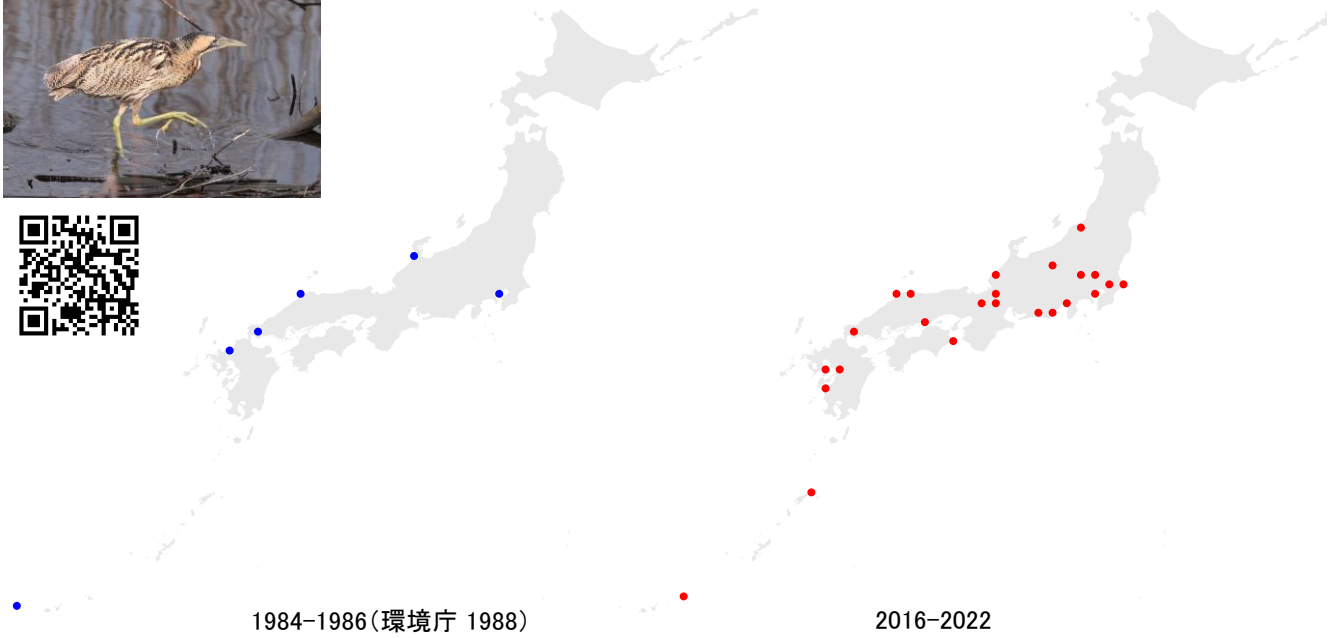
Great Cormorant *Phalacrocorax carbo* Length: 80-90cm Weight: 1400-2400g



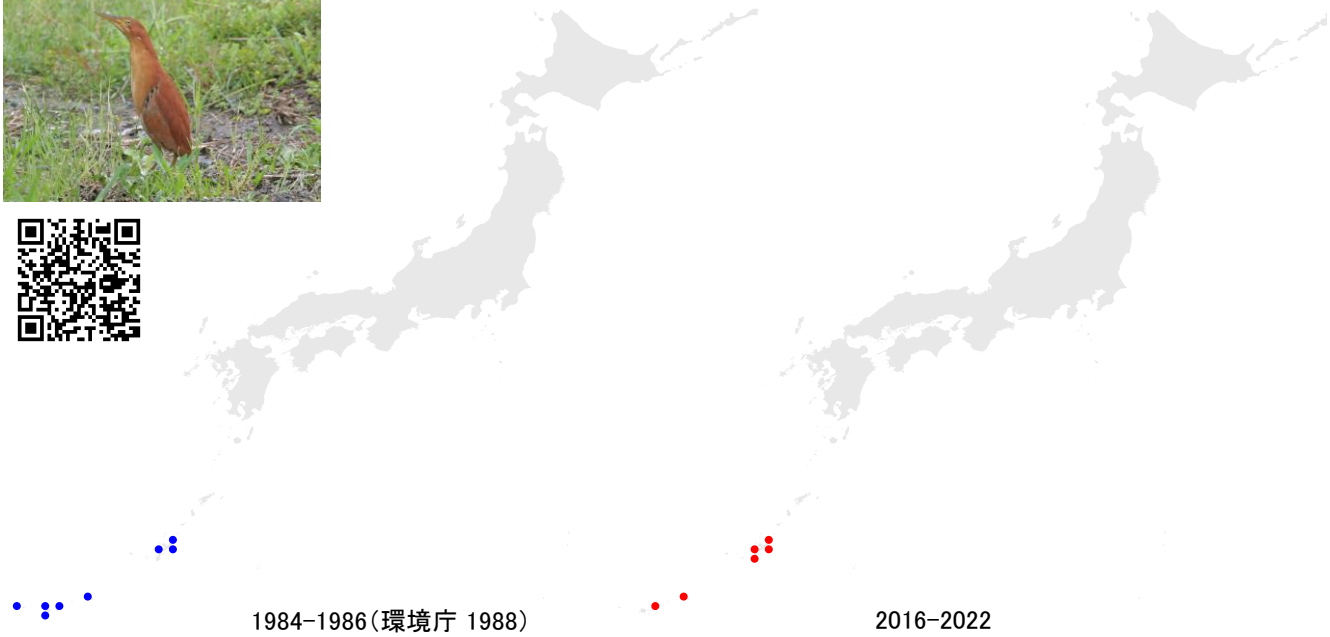
Japanese Cormorant *Phalacrocorax capillatus* Length: 80.0-86.5cm Weight: ♂3100±180g ♀2500±180g



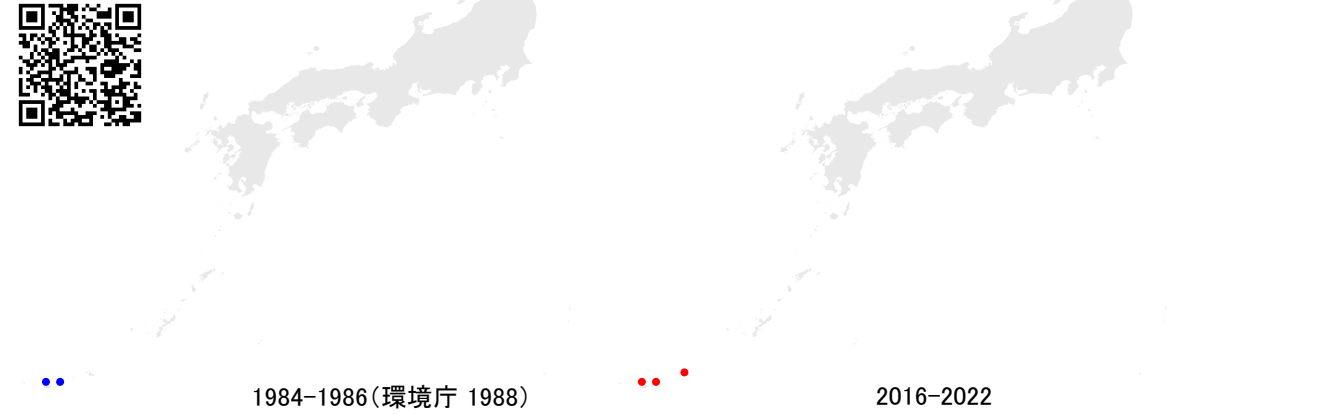
Eurasian Bittern *Botaurus stellaris* Length: 70cm Weight: 1000g



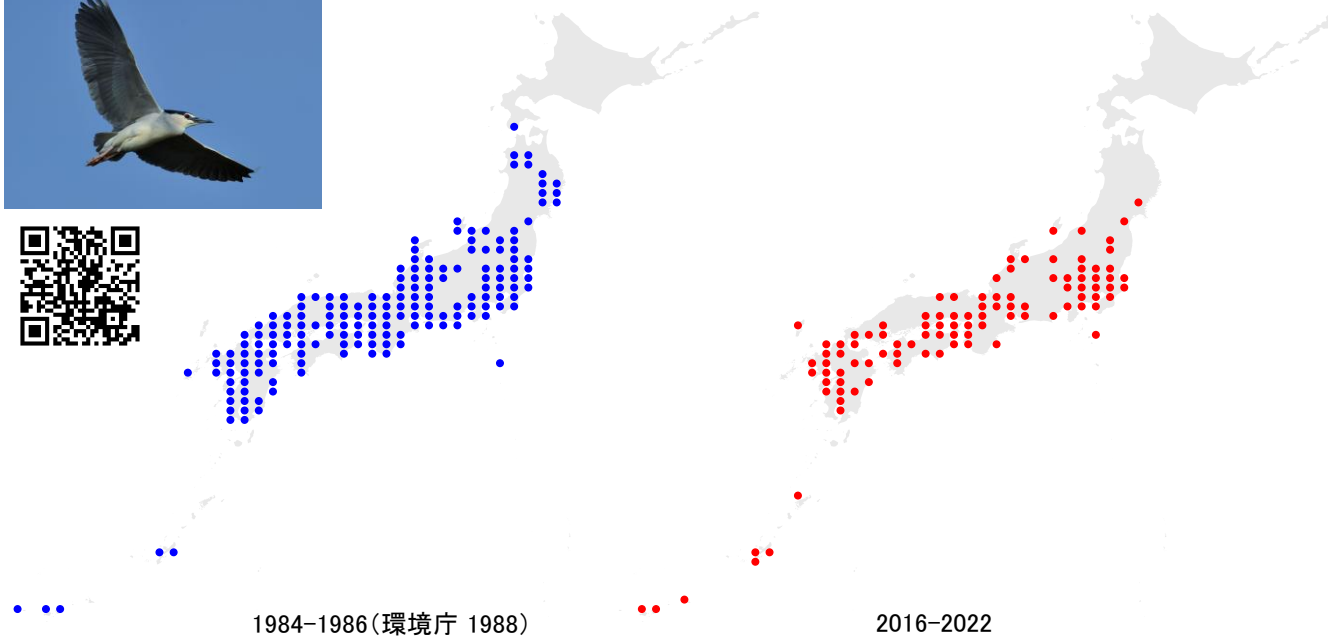
Cinnamon Bittern *Ixobrychus cinnamomeus* Length: 40cm Weight: 130-148g



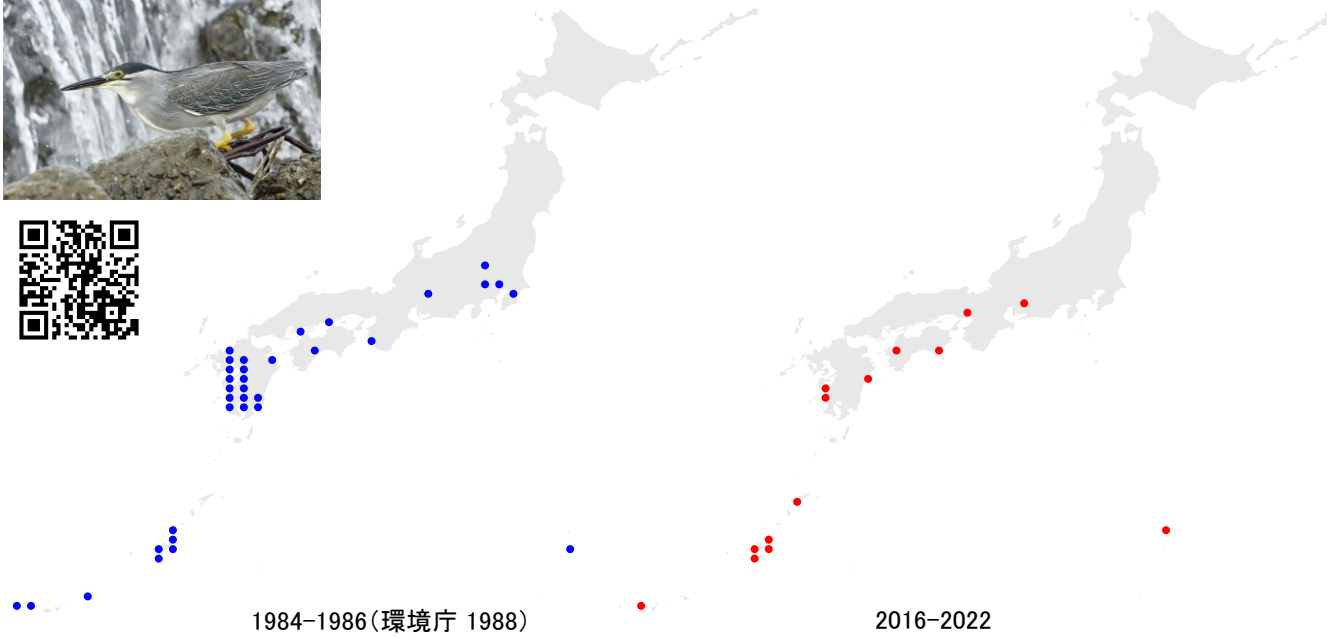
Malayan Night Heron *Gorsachius melanolophus* Length： 49cm



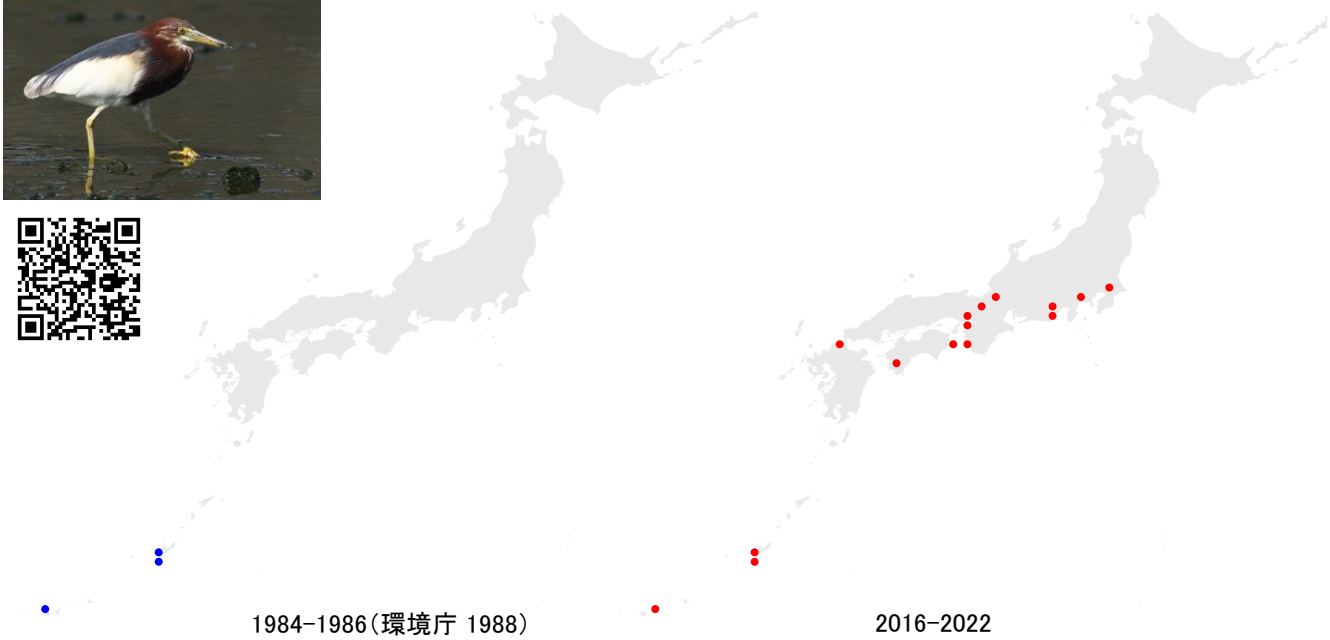
Black-crowned Night Heron *Nycticorax nycticorax* Length： 57.5cm Weight： 485-683g



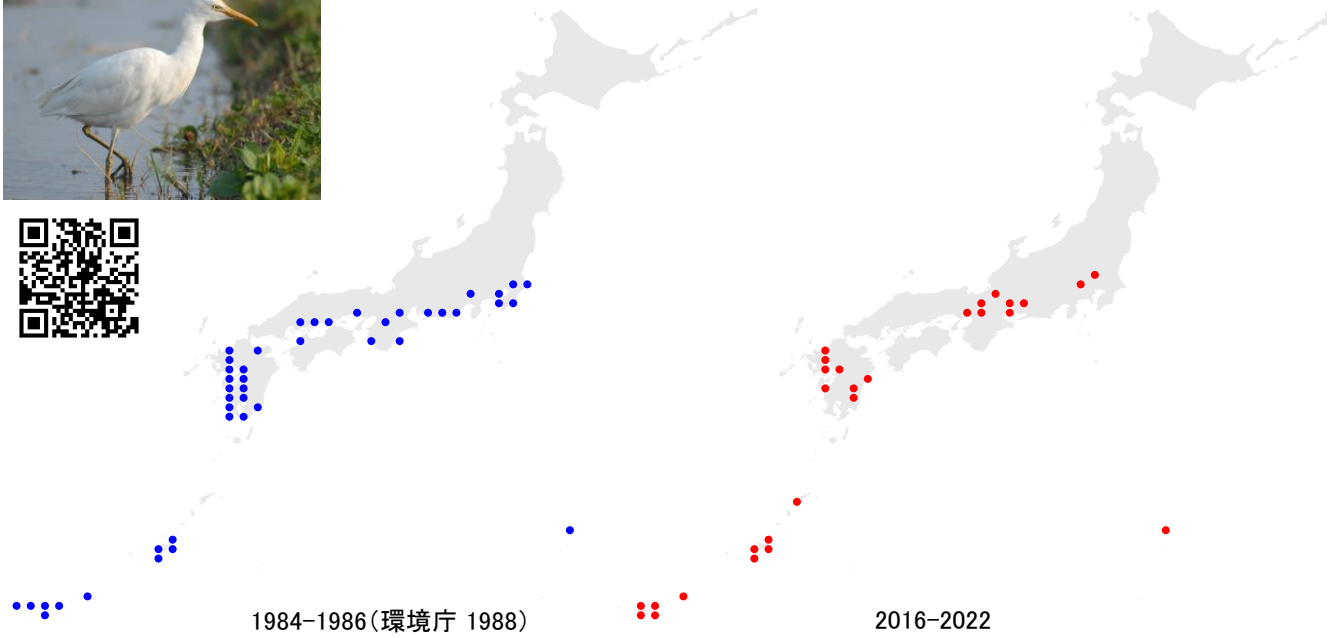
Striated Heron *Butorides striata* Length: 52cm Weight: 135-300g



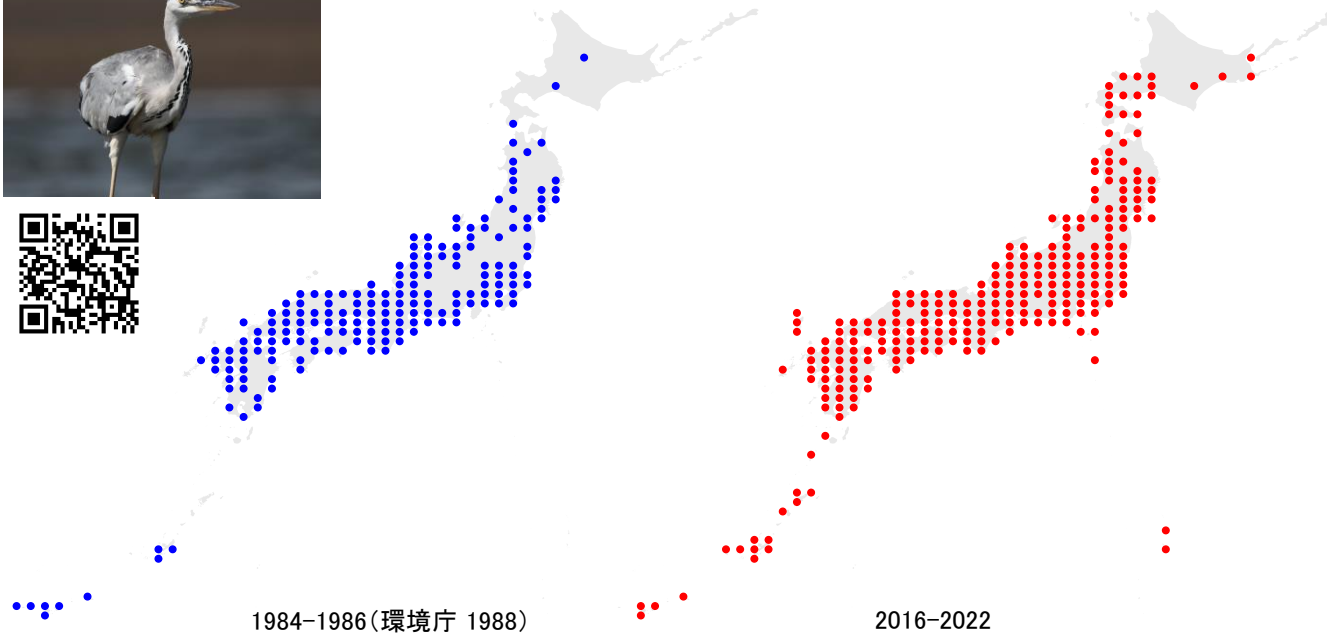
Chinese Pond Heron *Ardeola bacchus* Length: 45cm Weight: 220-380g



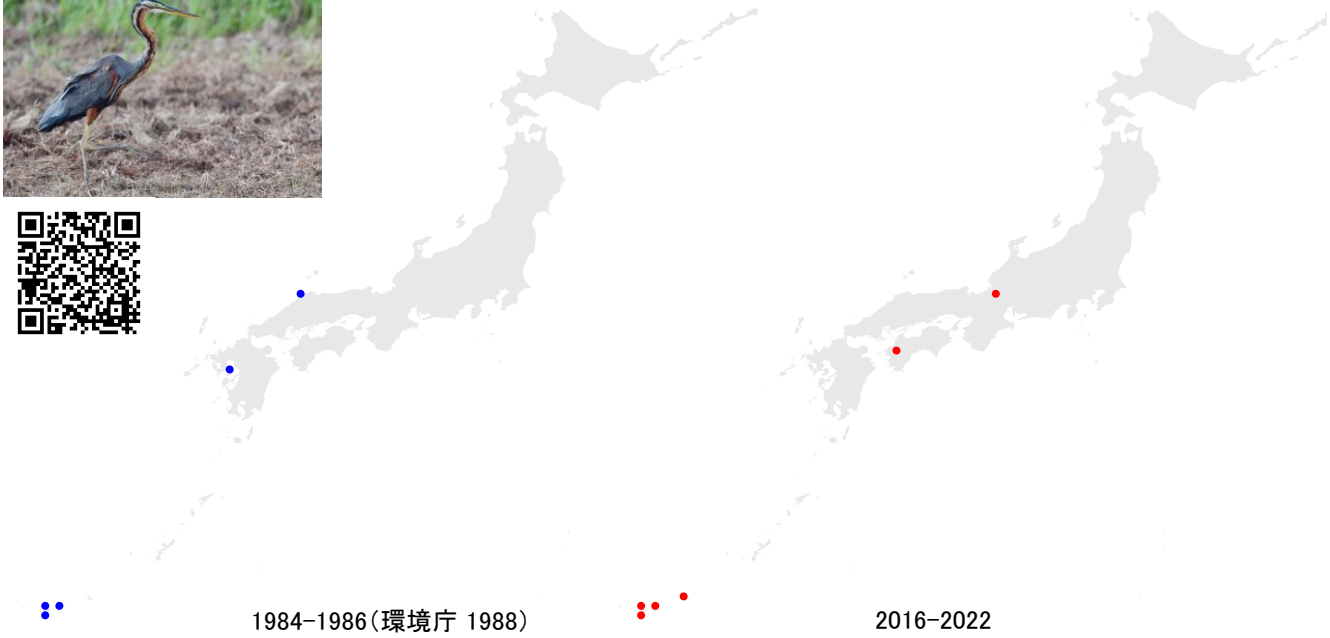
Eastern Cattle Egret *Bubulcus ibis* Length: 46-56cm Weight: ♂311g ♀304g



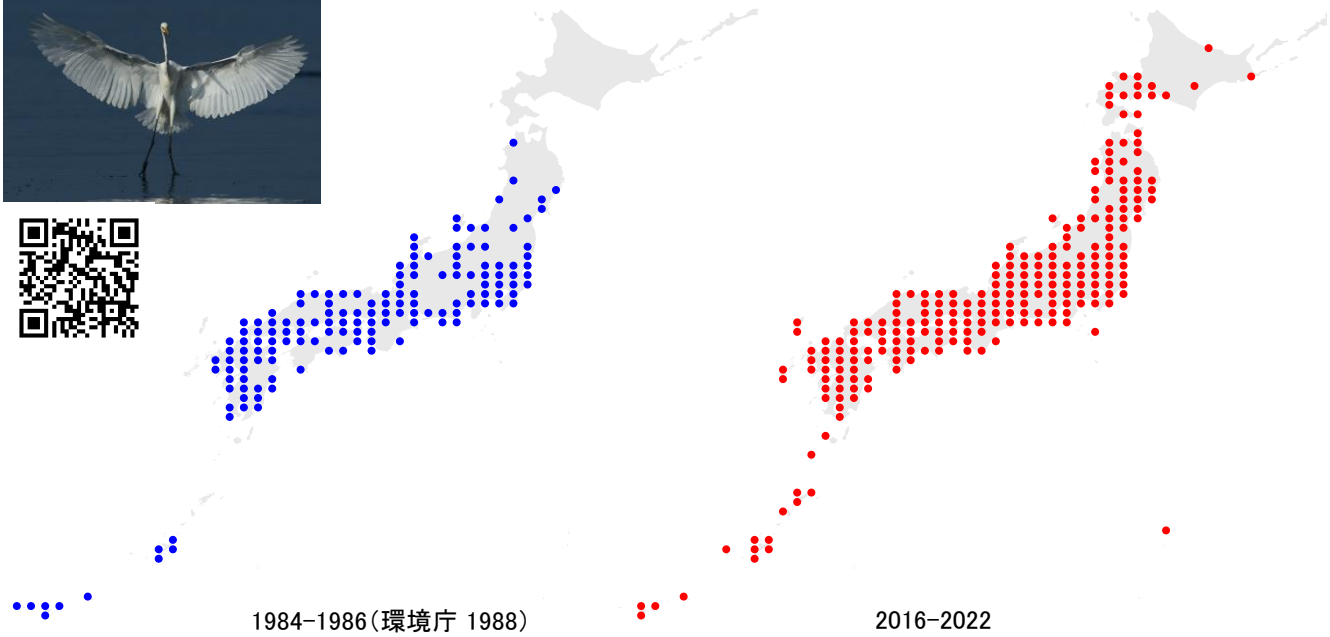
Grey Heron *Ardea cinerea* Length: 90-98cm Weight: ♂1071-2073g ♀1020-1785g



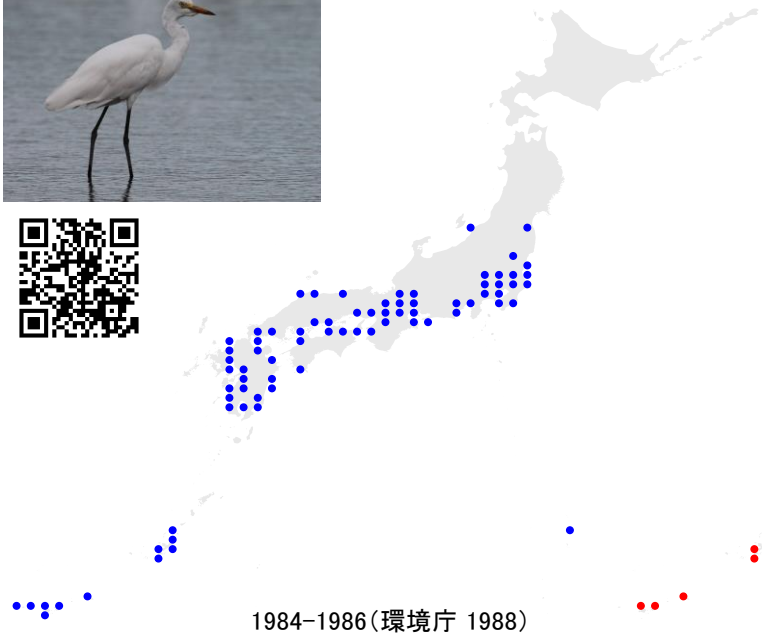
Purple Heron *Ardea purpurea* Length: 78-90cm Weight: 525-1345g



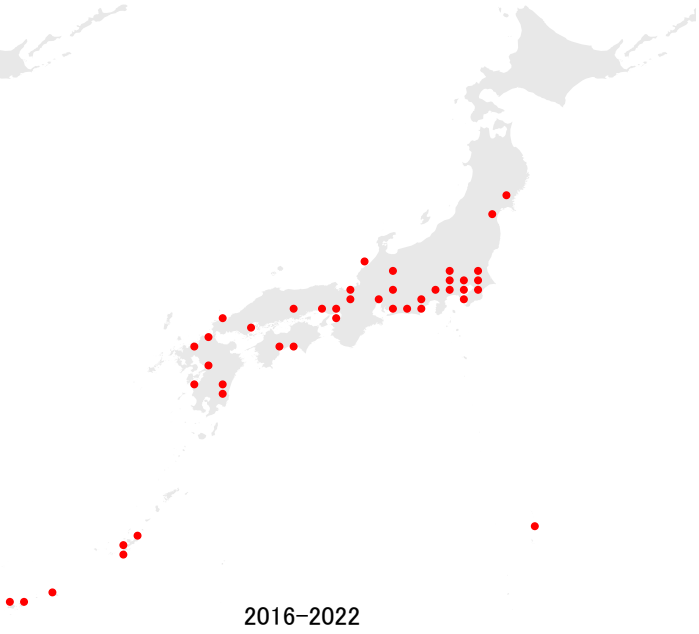
Great Egret *Ardea alba* Length: 84-94cm Weight: 700-1200g



Intermediate Egret　*Egretta intermedia*　Length：65-72cm　Weight：430-630g

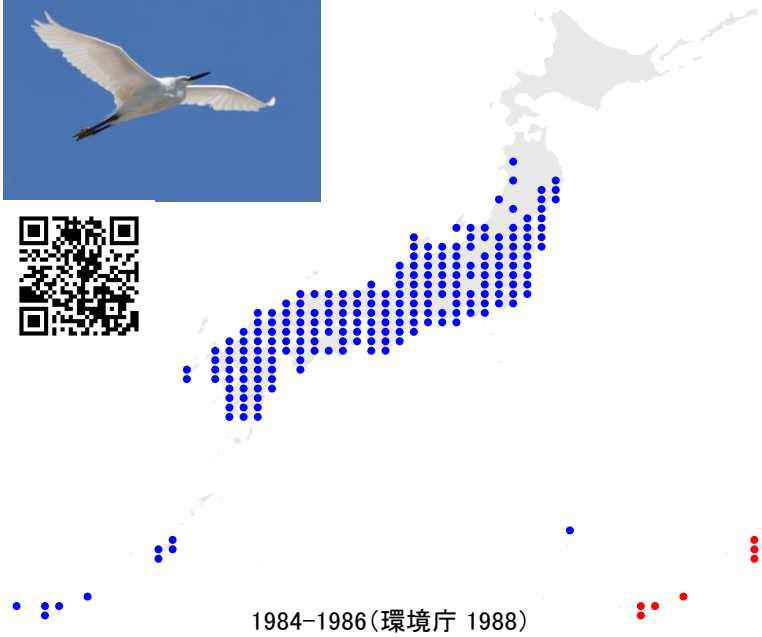


1984-1986（環境庁 1988）

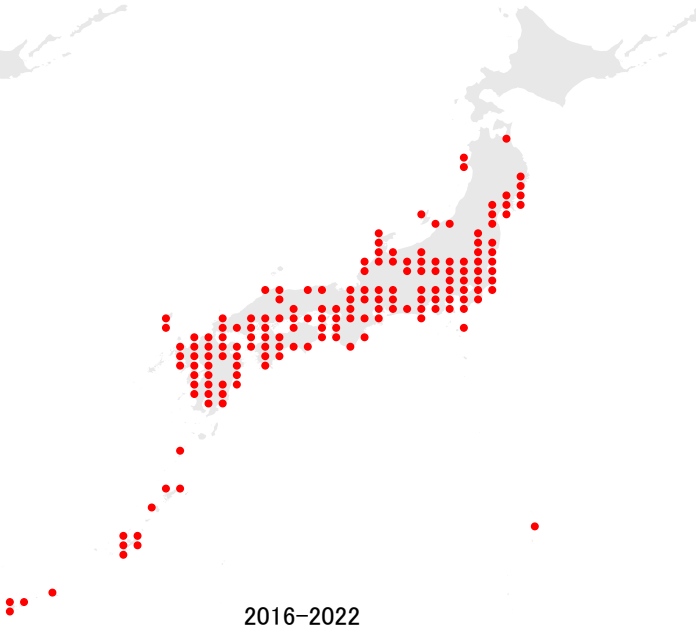


2016-2022

Little Egret　*Egretta garzetta*　Length：♂62cm ♀58cm　Weight：♂604.5±20.40g ♀487.2±16.10g

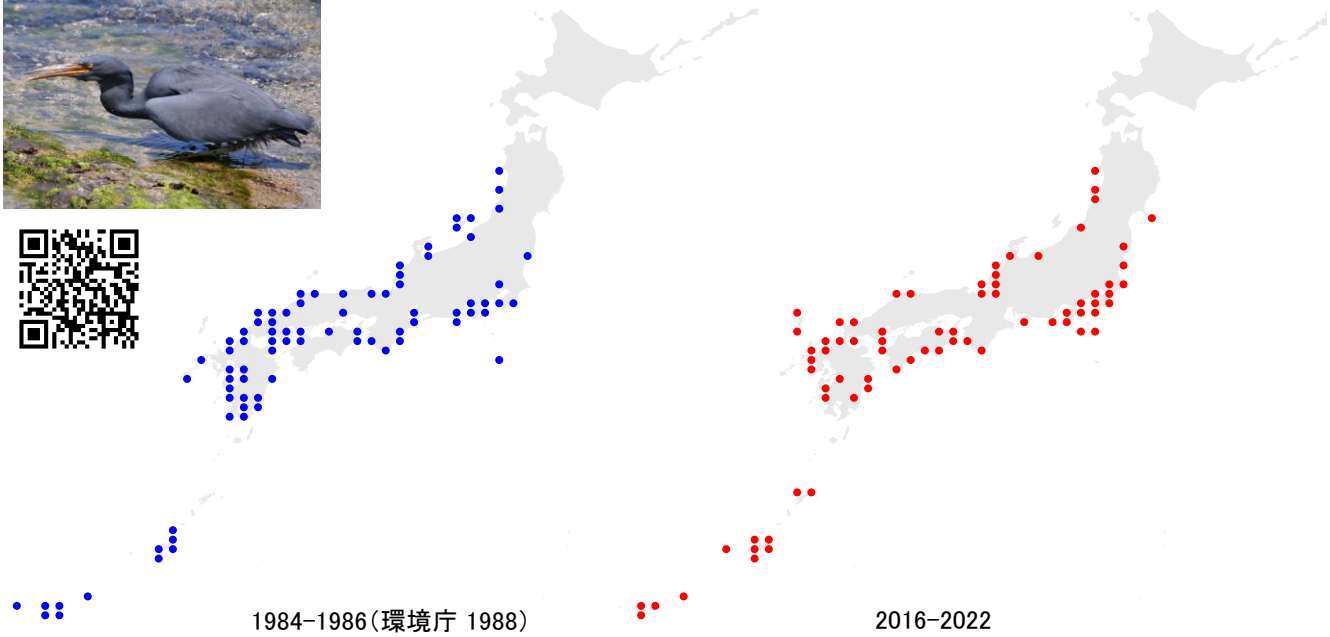


1984-1986（環境庁 1988）

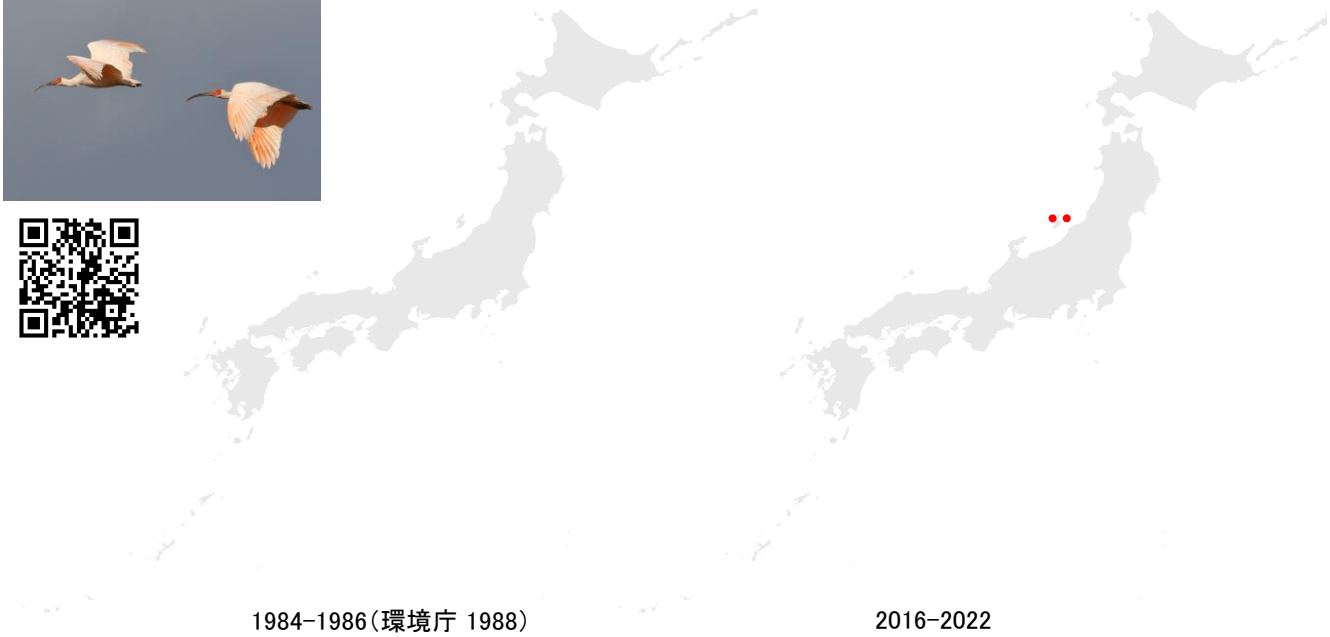


2016-2022

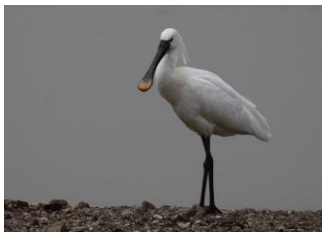
Pacific Reef Heron *Egretta sacra* Length: 58-66cm Weight: 330-700g

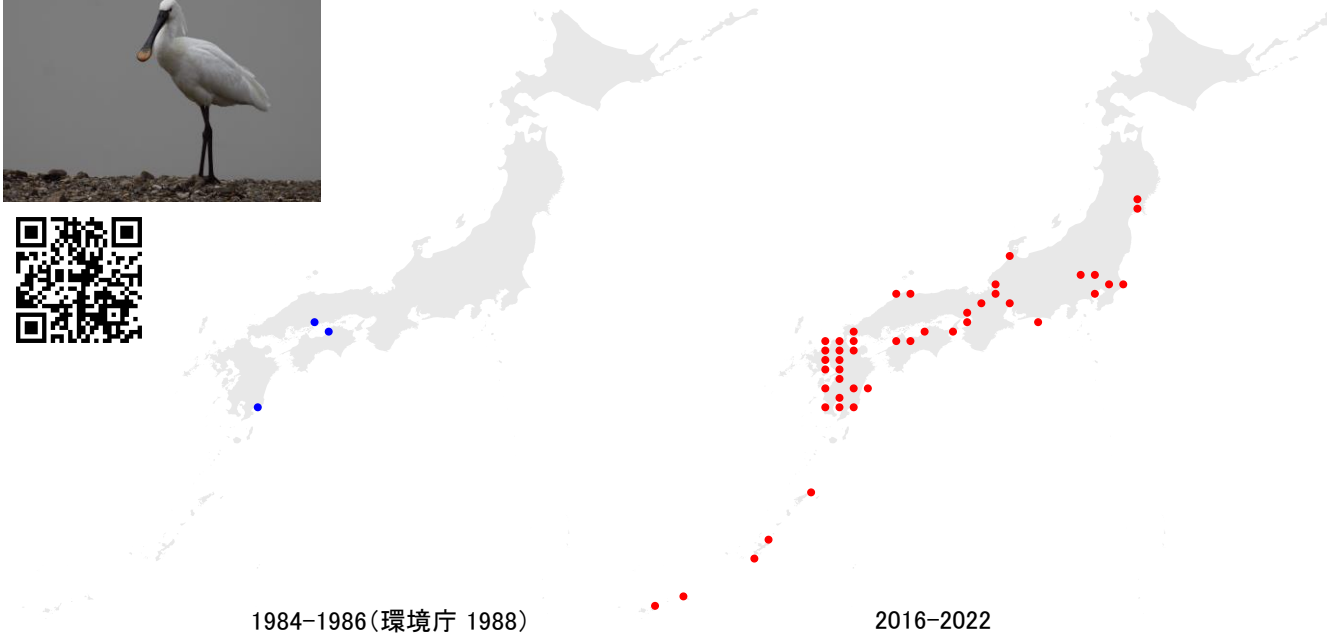


Crested Ibis *Nipponia nippon* Length: ♂77±3.3cm ♀73±2.7cm Weight: ♂1776±120g ♀1545±107g

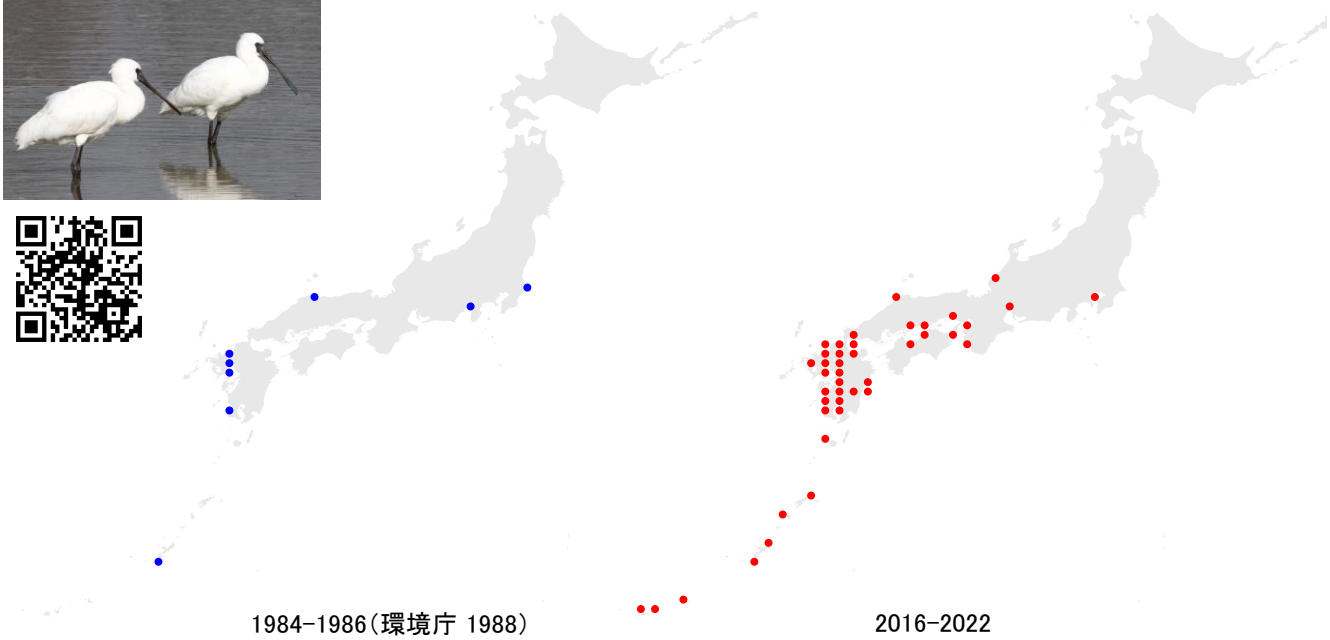


Eurasian Spoonbill *Platalea leucorodia* Length: 86cm Weight: 1130-1960g

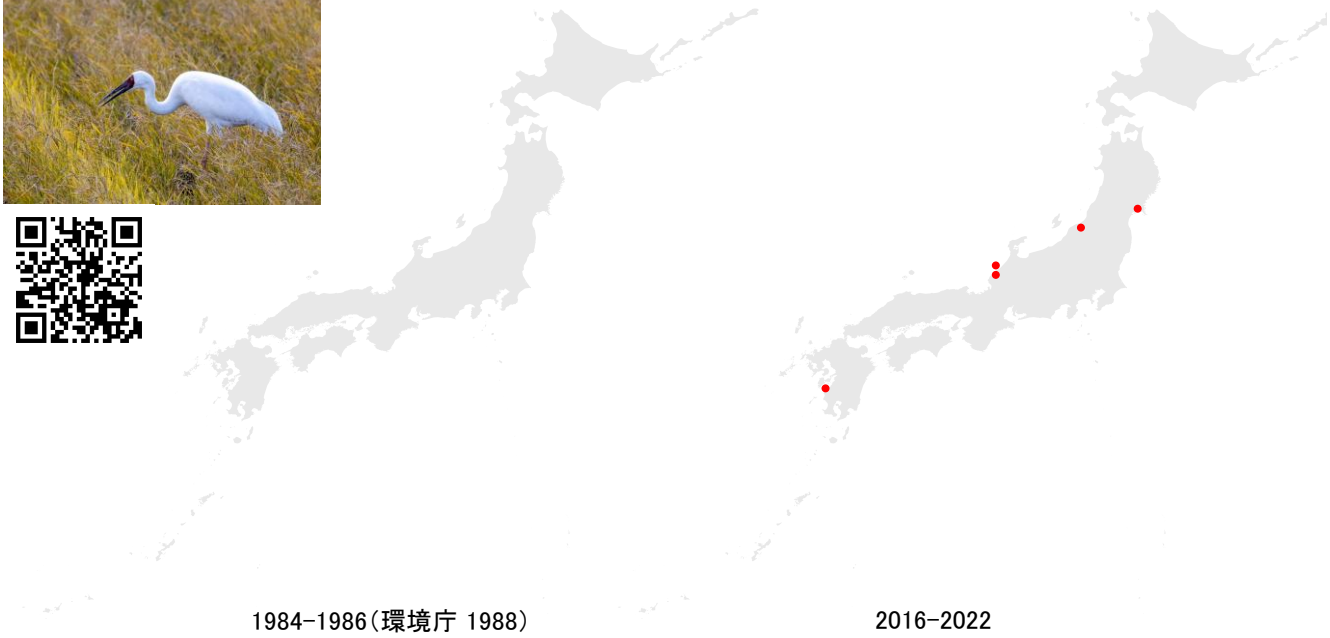




Black-faced Spoonbill *Platalea minor* Length: 68.8-77.7cm Weight: 1470-1900g

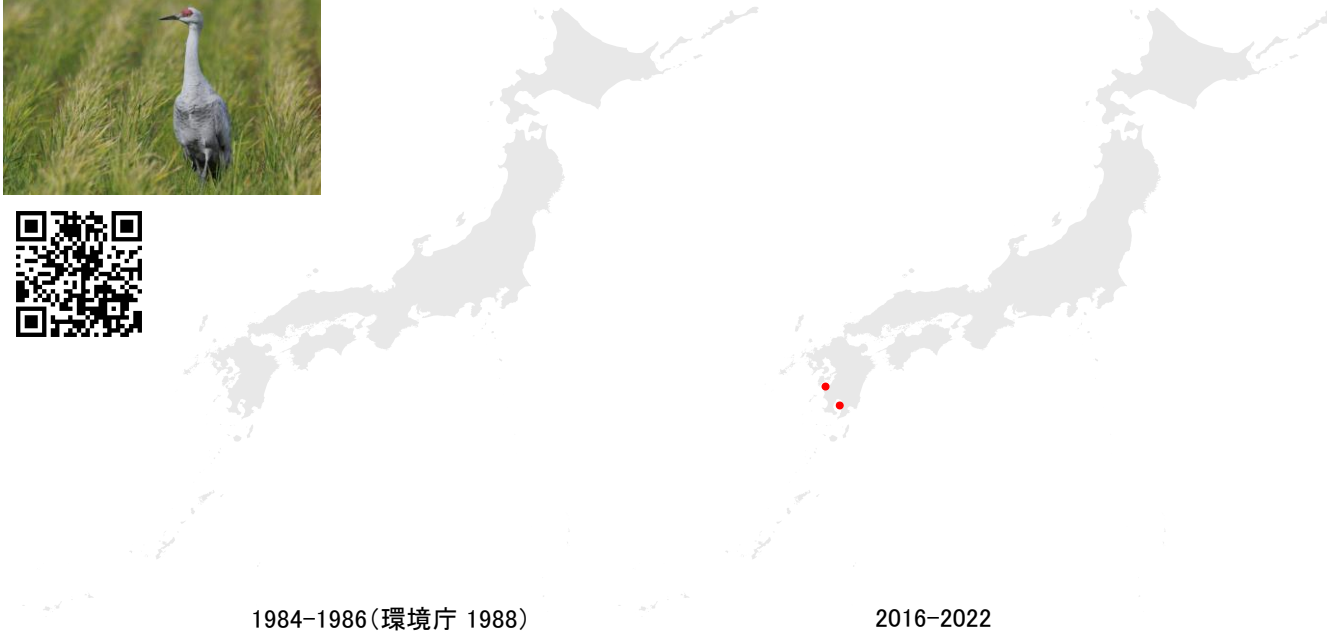


Siberian Crane *Grus leucogeranus* Length: 140cm Weight: 5670-8620g



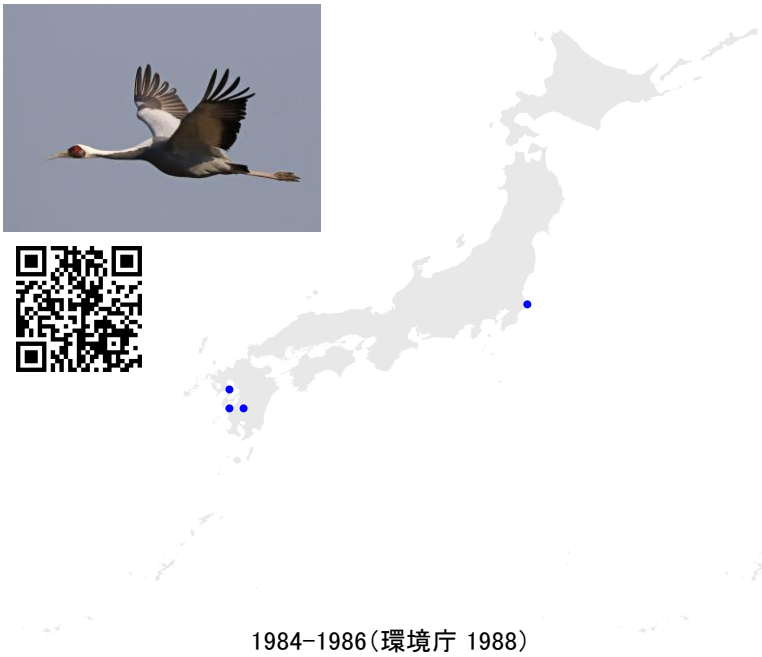
1984-1986（環境庁 1988） 2016-2022

Sandhill Crane *Grus canadensis* Length: 100cm Weight: 3200-3500g

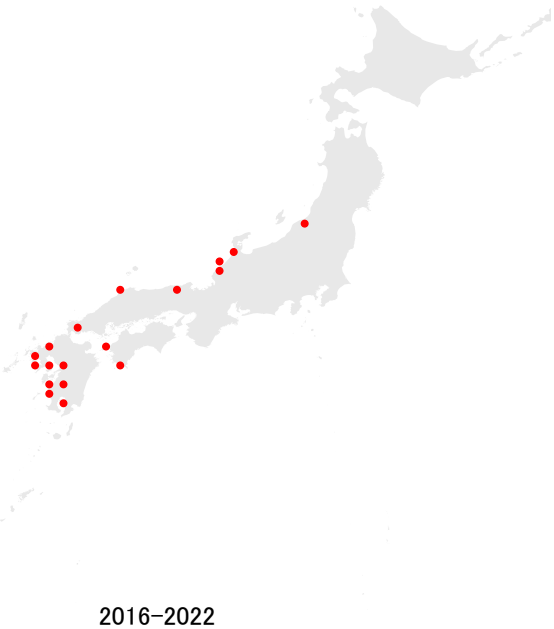


1984-1986（環境庁 1988） 2016-2022

White-naped Crane *Grus vipio* Length: 125cm Weight: 5100-6000kg

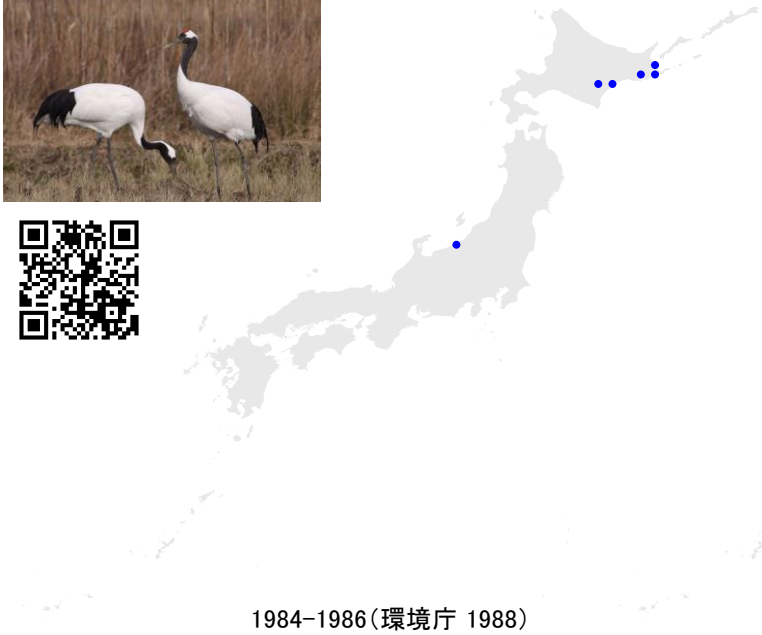


1984-1986（環境庁 1988）

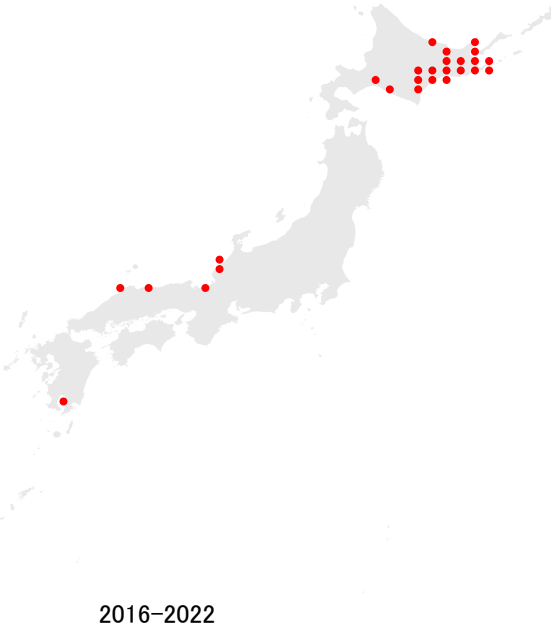


2016-2022

Red-crowned Crane *Grus japonensis* Length: ♂136.5cm ♀124.7cm Weight: ♂8137±138g ♀7321±133g



1984-1986（環境庁 1988）



2016-2022

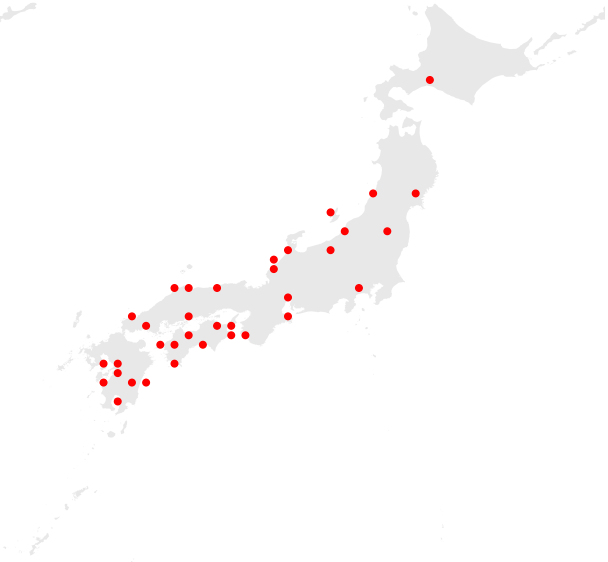
Common Crane *Grus grus* Length: 110-125cm Weight: 3000-6000g

1984-1986(環境庁 1988)

2016-2022

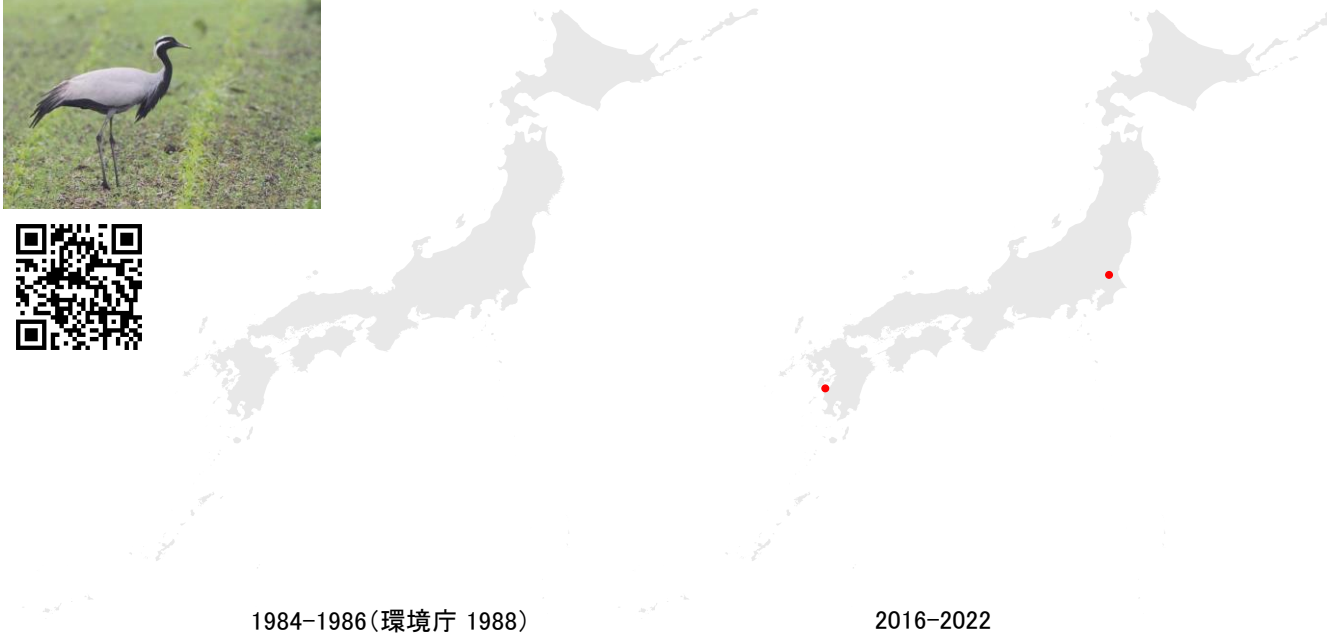
Hooded Crane *Grus monacha* Length: 100cm Weight: ♂3280-4870g ♀3400-3740g

1984-1986(環境庁 1988)

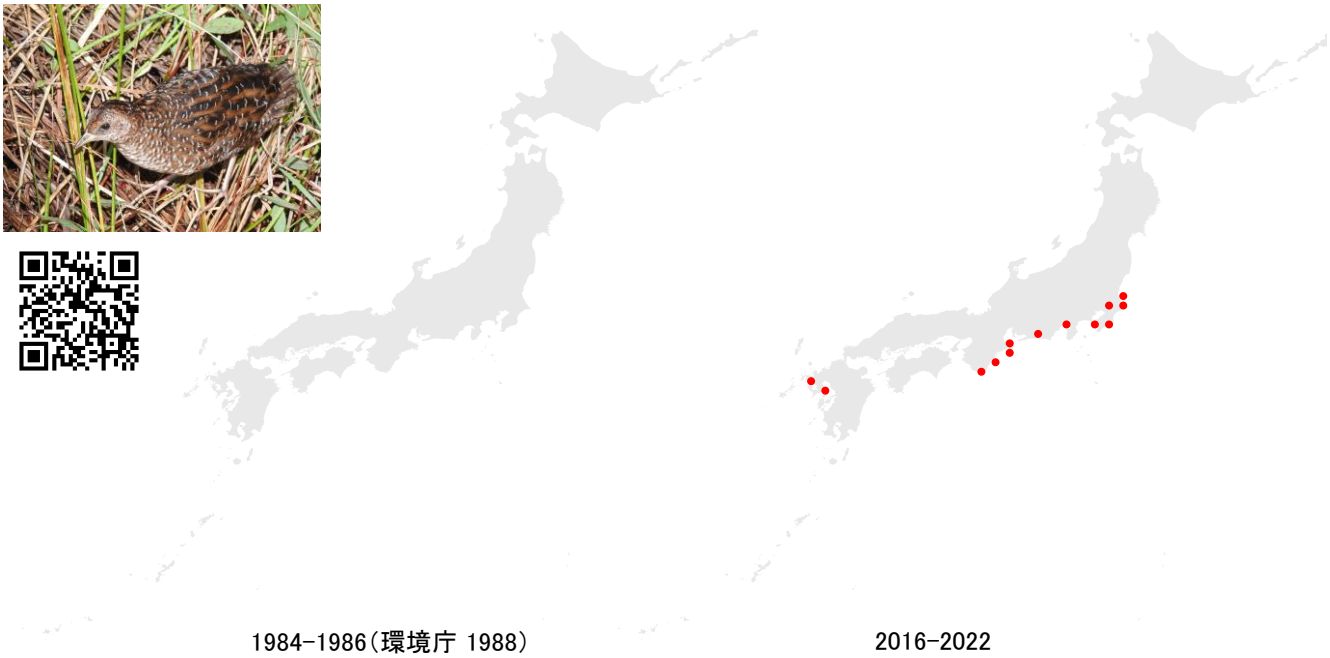


2016-2022

Demoiselle Crane *Anthropoides virgo* Length: 90cm Weight: 2100-2500g



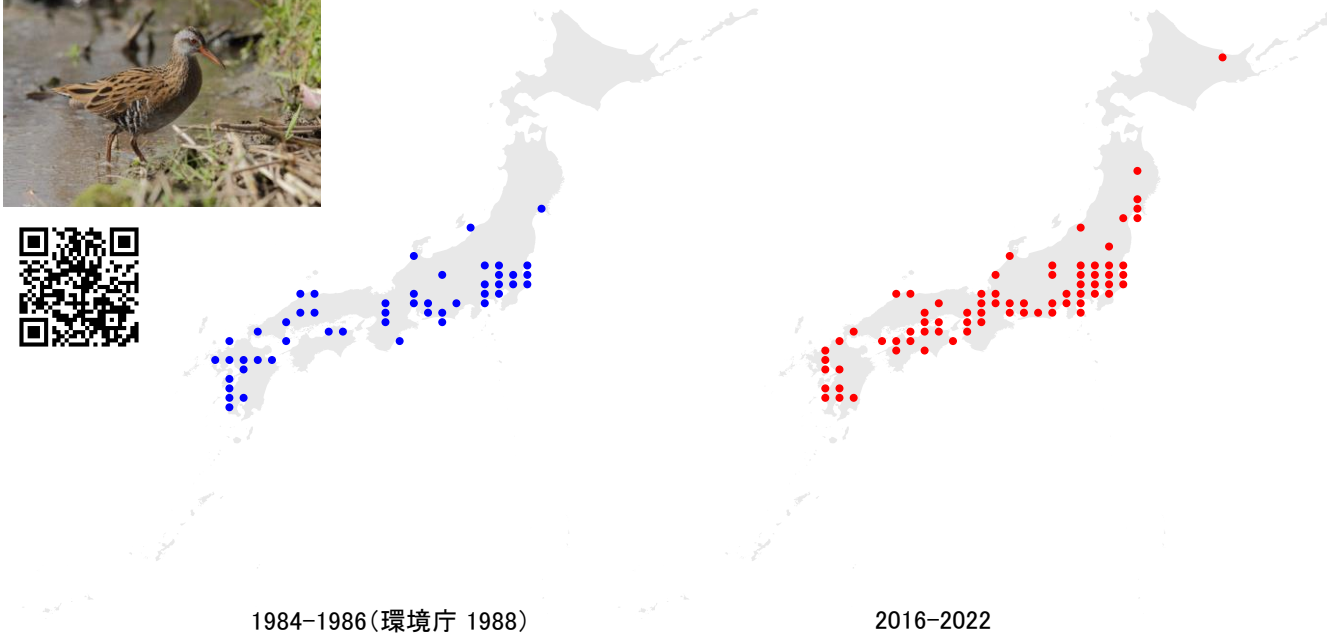
Swinhoe's Rail *Coturnicops exquisitus* Length: 12cm Weight: 36g



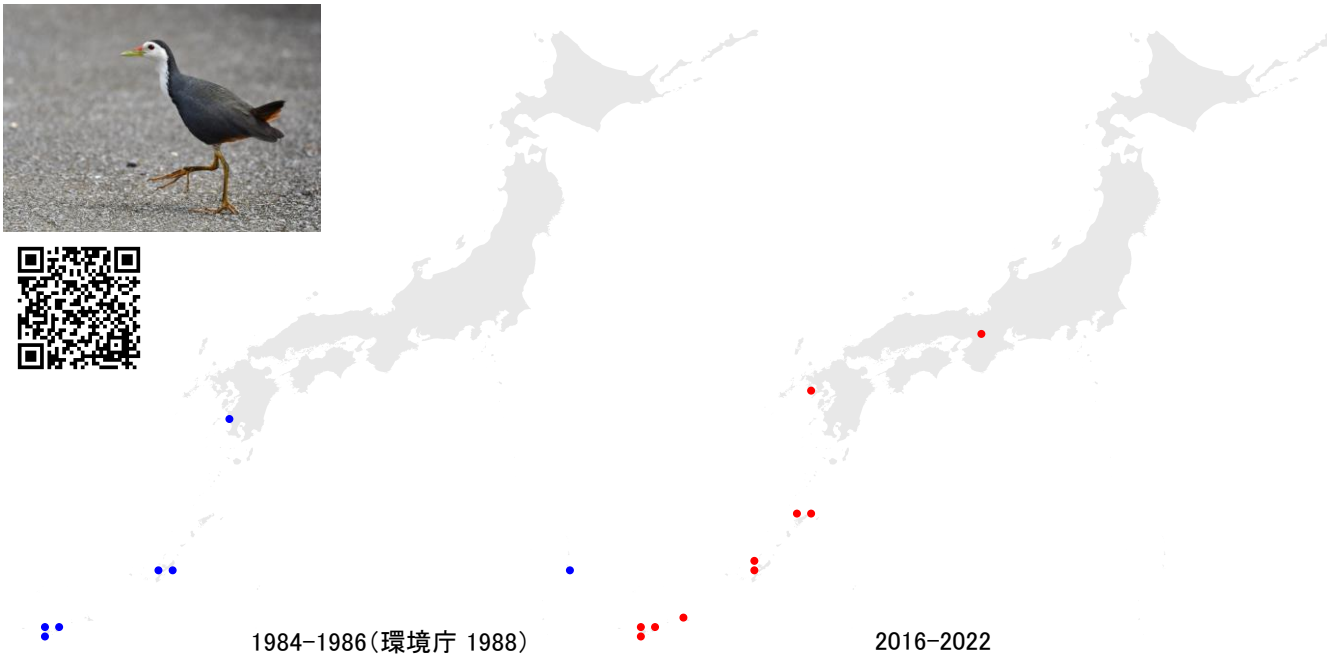
Slaty-legged Crake *Rallina eurizonoides* Length： 25cm

Okinawa Rail *Gallirallus okinawae* Length： 29-33cm Weight： 340-430g

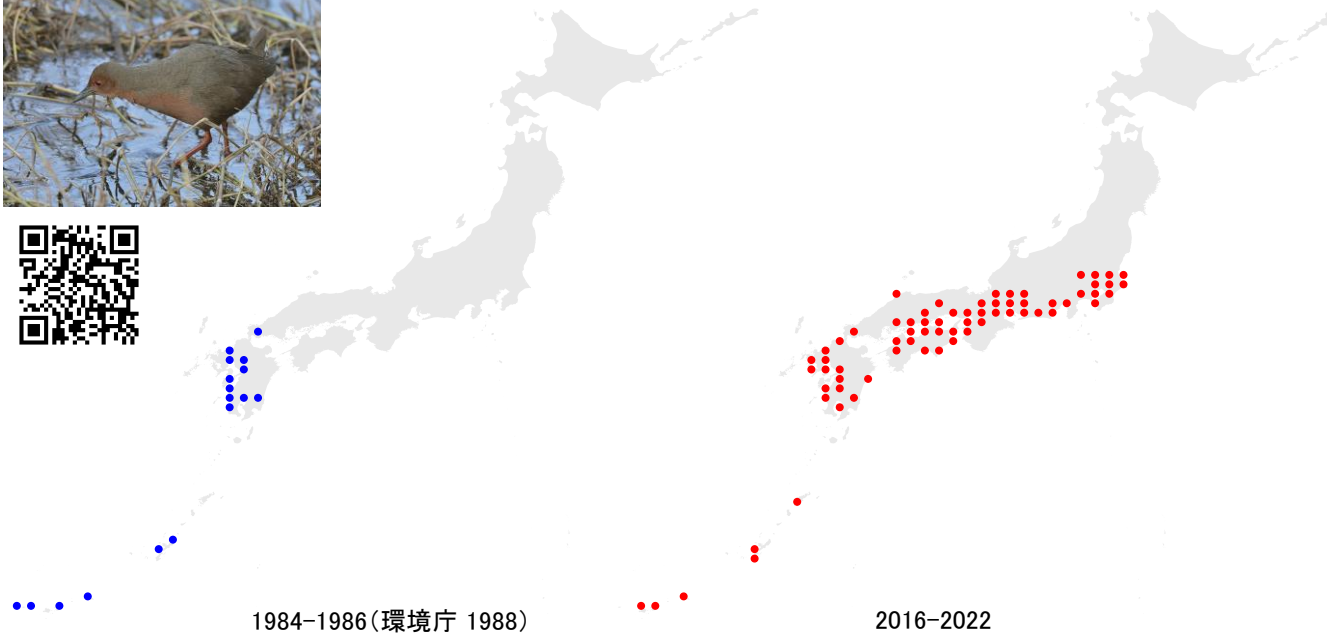
Brown-cheeked Rail *Rallus aquaticus* Length: 29cm Weight: 85-190g



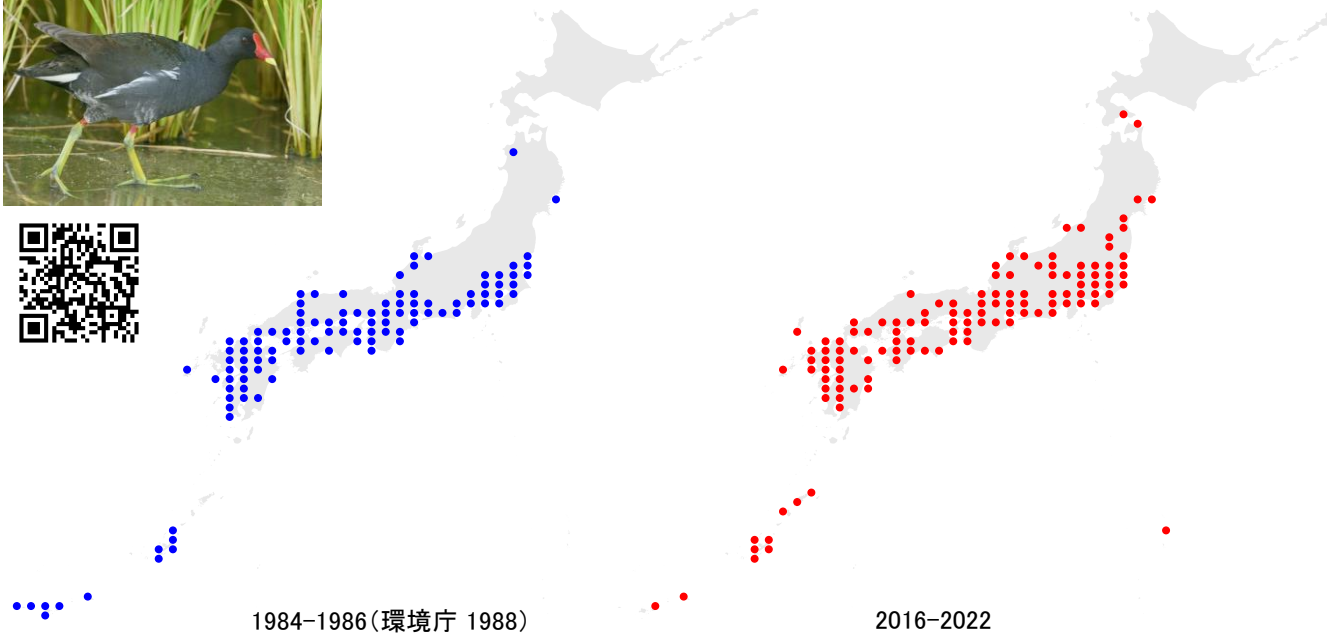
White-breasted Waterhen *Amaurornis phoenicurus* Length: 32cm Weight: 170-330g



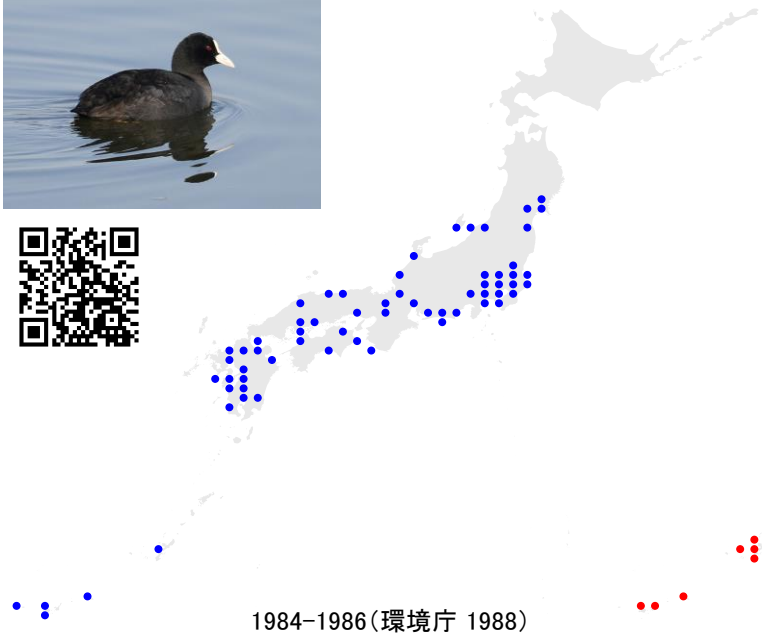
Ruddy-breasted Crake　　Porzana fusca　　Length：22.7cm　　Weight：77.5g



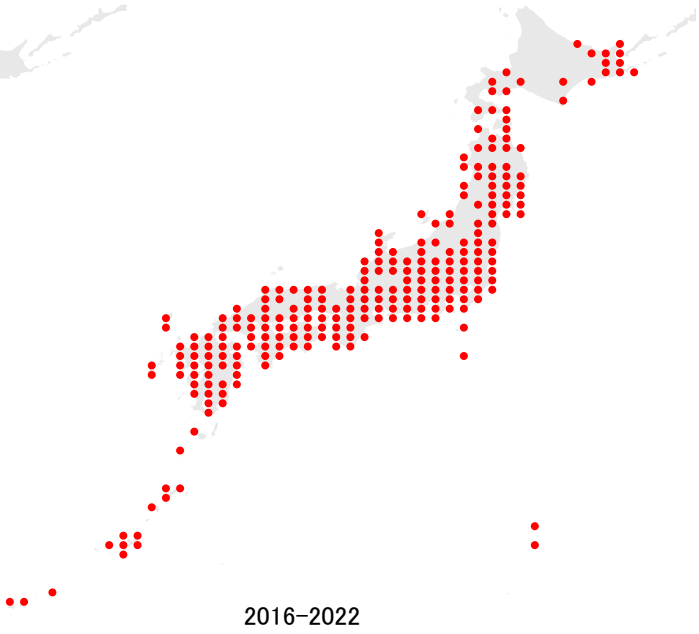
Common Moorhen　　*Gallinula chloropus*　　Length：32cm　　Weight：200-450g



Eurasian Coot *Fulica atra* Length: 36-45cm Weight: ♂610-1200g ♀610-1150g

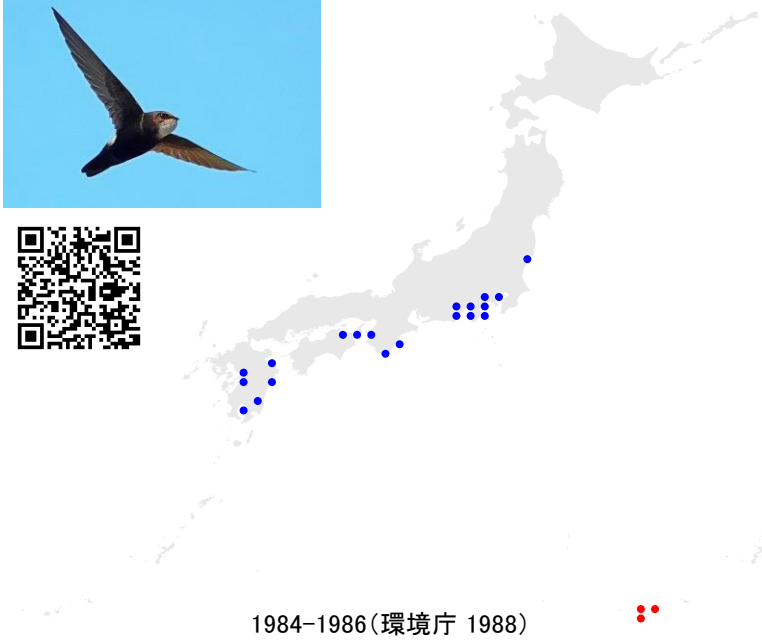


1984-1986（環境庁 1988）

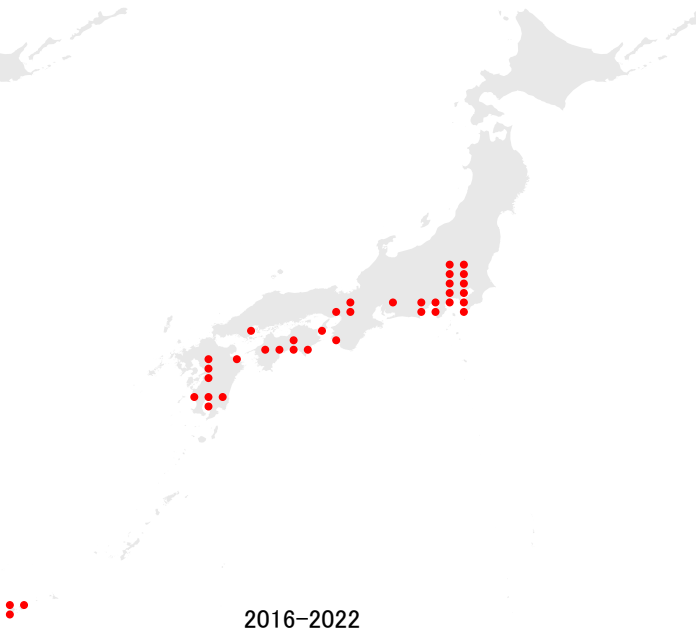


2016-2022

House Swift *Apus nipalensis* Length: 15cm Weight: 28.8±2.5g

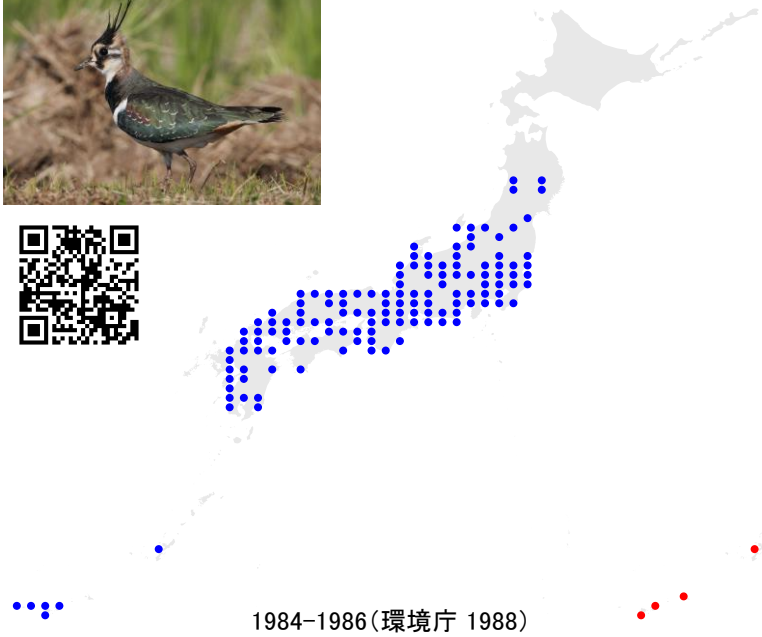


1984-1986（環境庁 1988）

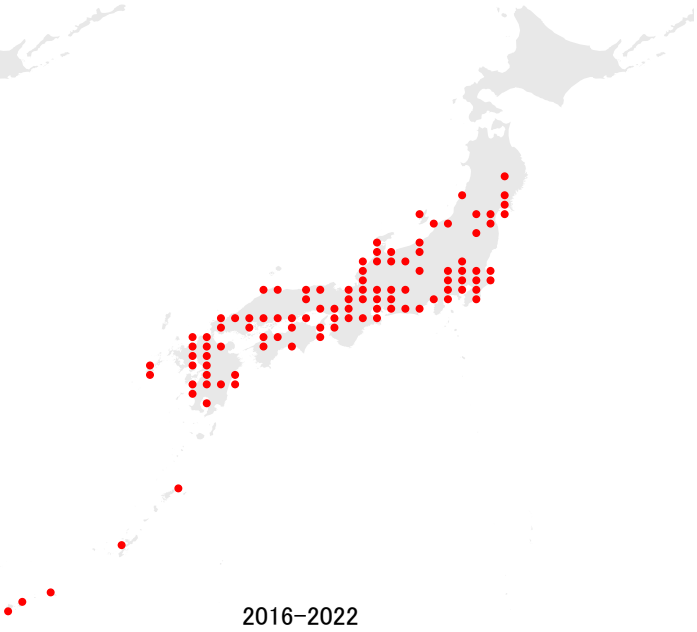


2016-2022

Northern Lapwing *Vanellus vanellus* Length: 31cm Weight: 180-270g

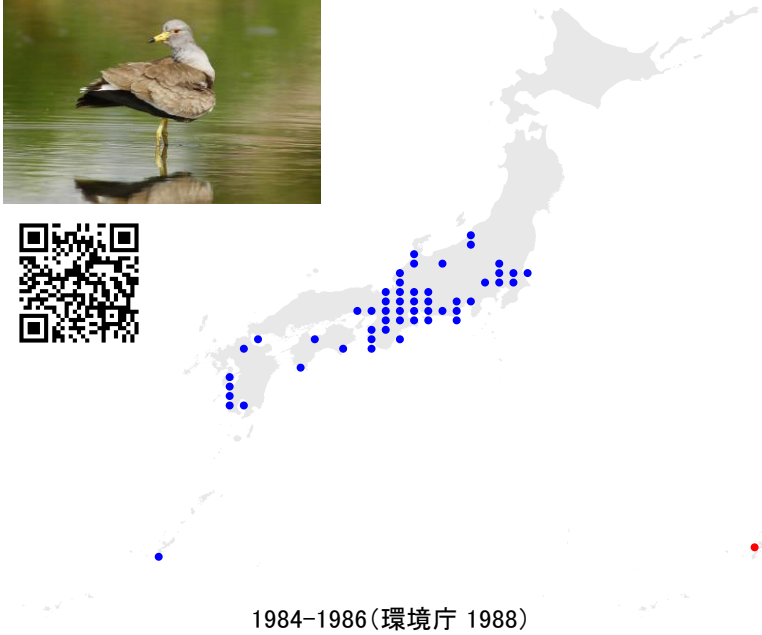


1984-1986（環境庁 1988）

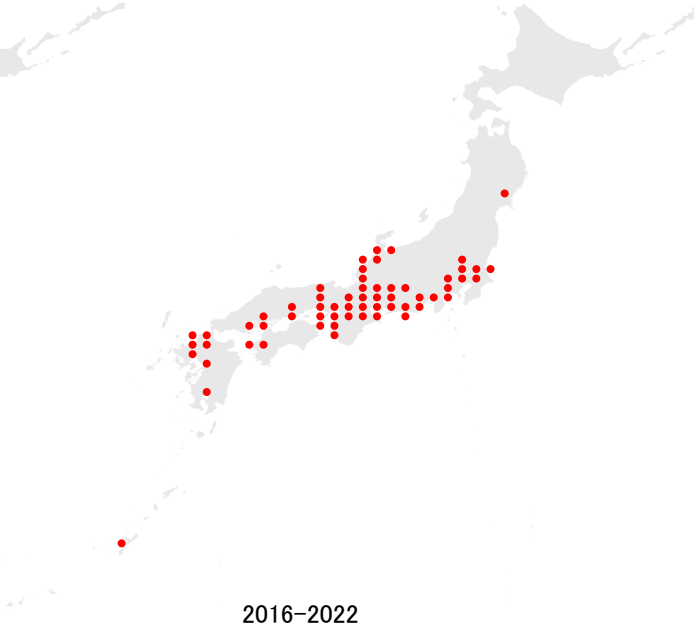


2016-2022

Grey-headed Lapwing *Vanellus cinereus* Length: ♂34.2cm ♀33.6cm Weight: :♂280.1g ♀266.6g

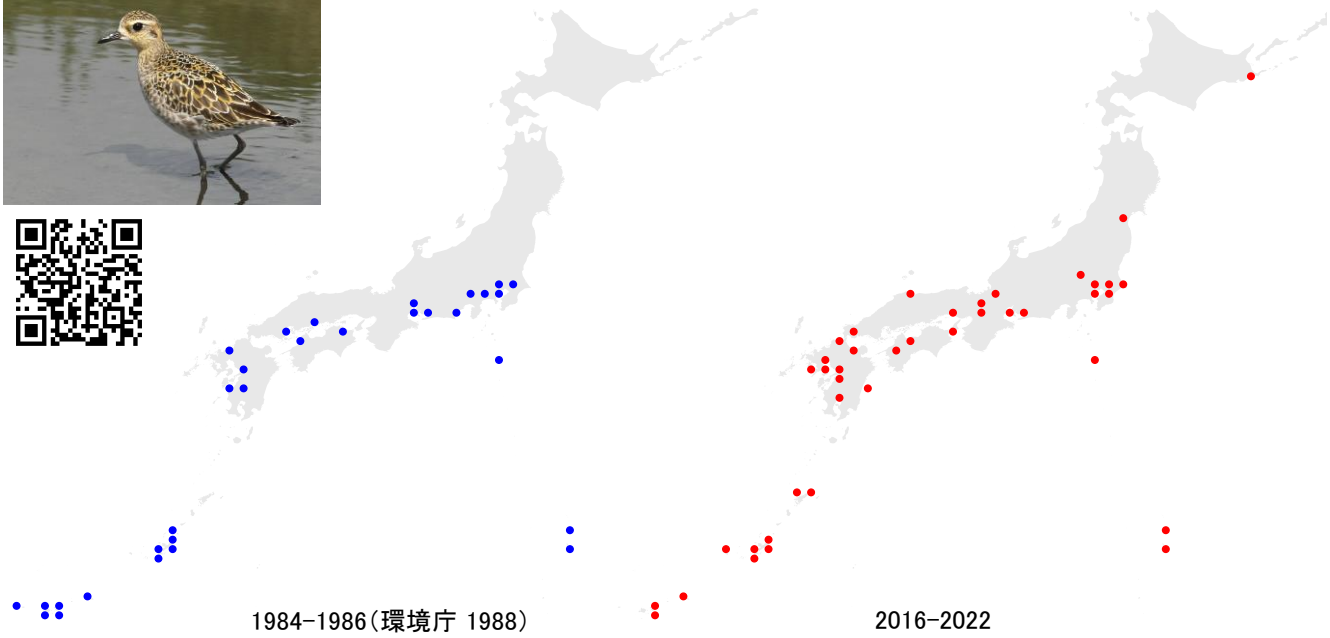


1984-1986（環境庁 1988）

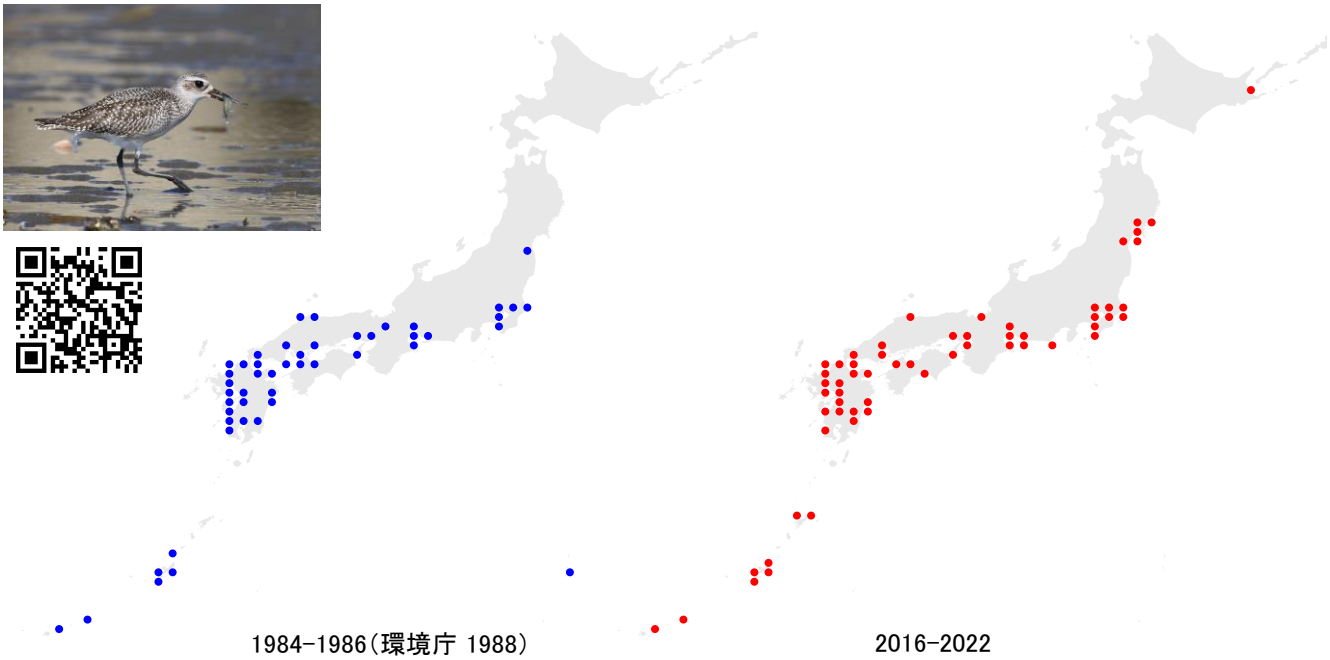


2016-2022

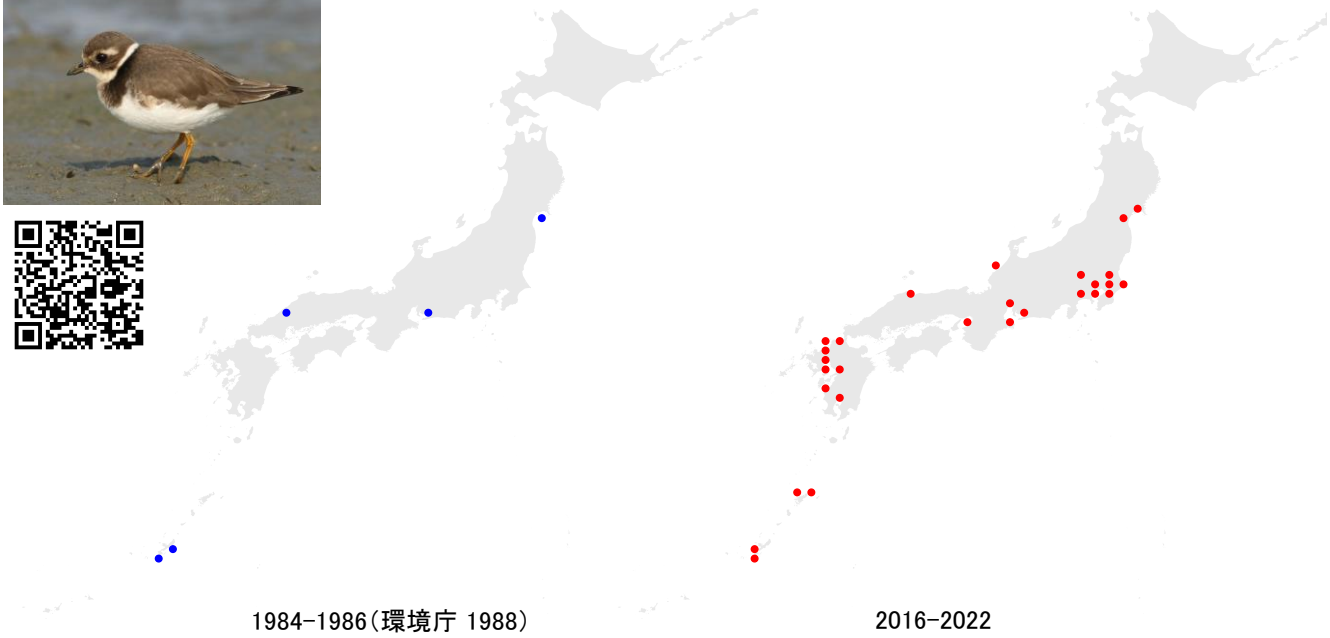
Pacific Golden Plover *Pluvialis fulva* Length: 22.2-25.9cm Weight: 93.8-177.4g



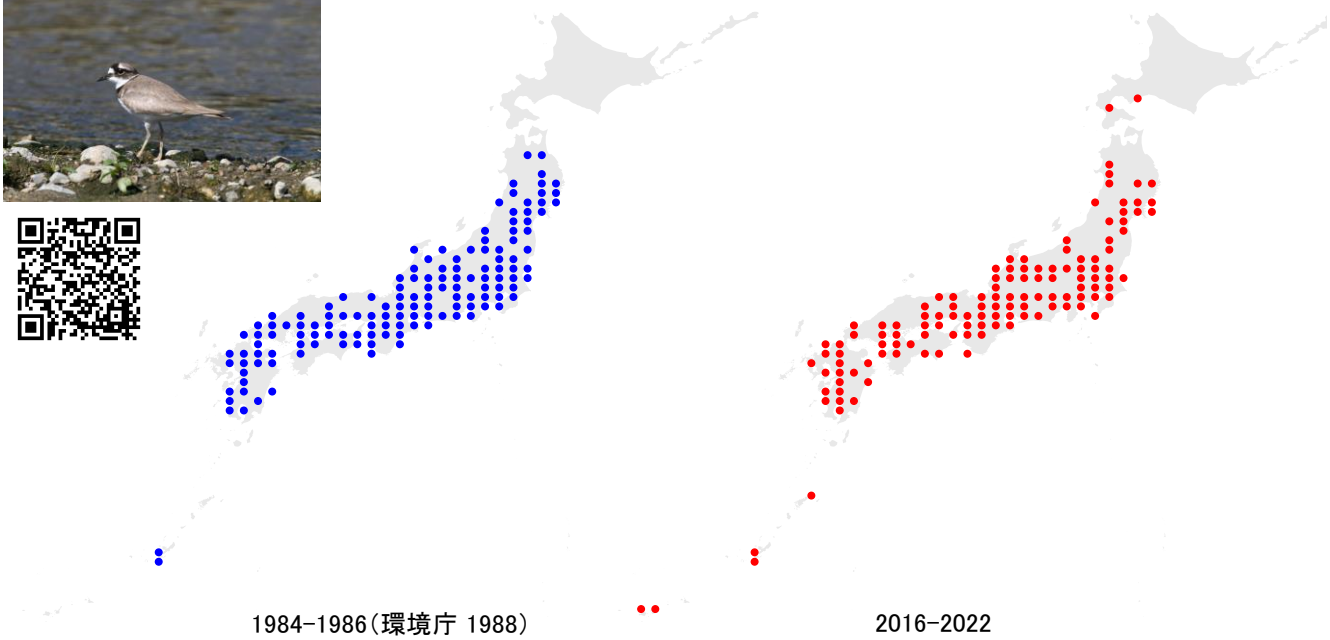
Grey Plover *Pluvialis squatarola* Length: 29cm Weight: 180-350g



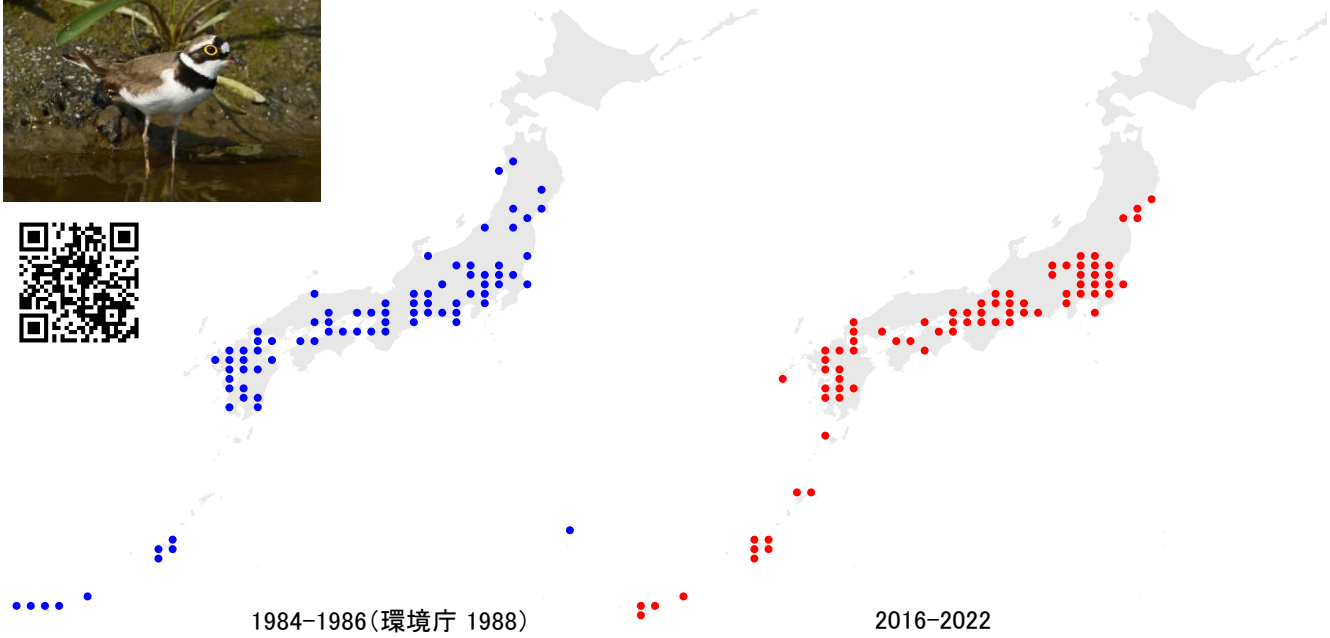
Common Ringed Plover *Charadrius hiaticula* Length: 18-20cm Weight: 53-60g



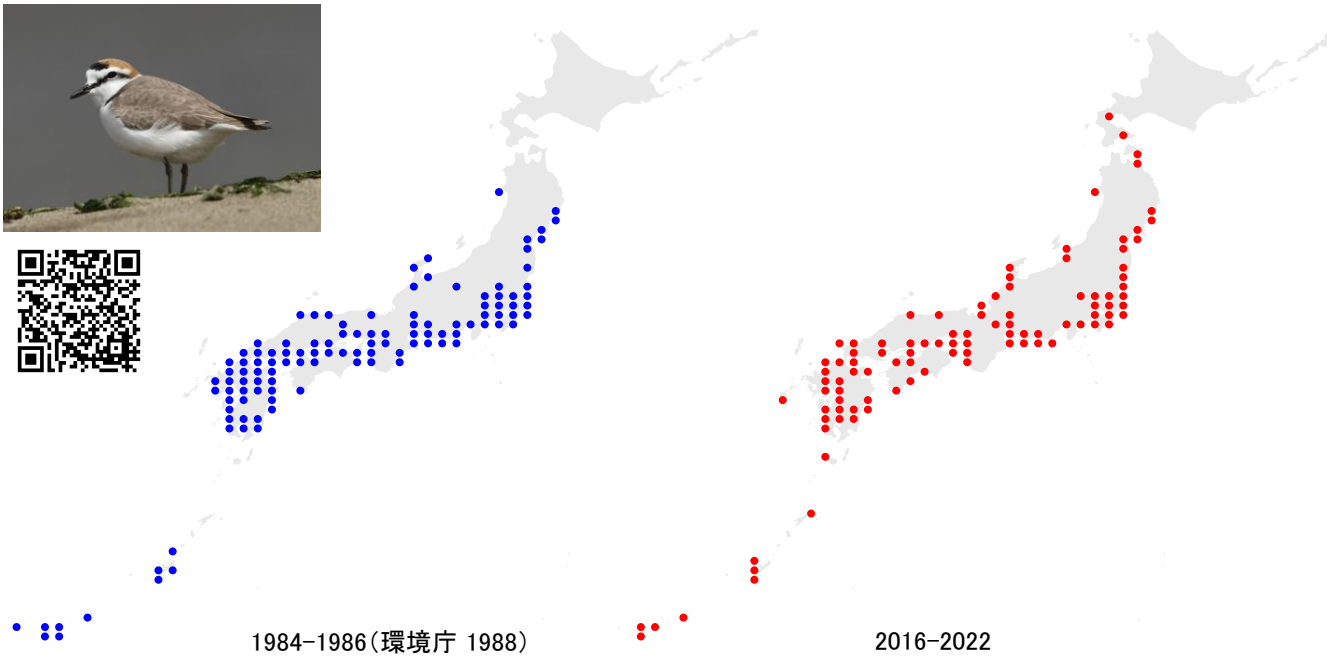
Long-billed Plover *Charadrius placidus* Length: 19.7-22.2cm Weight: ♂63.6±3.3g ♀68.1±4.2g



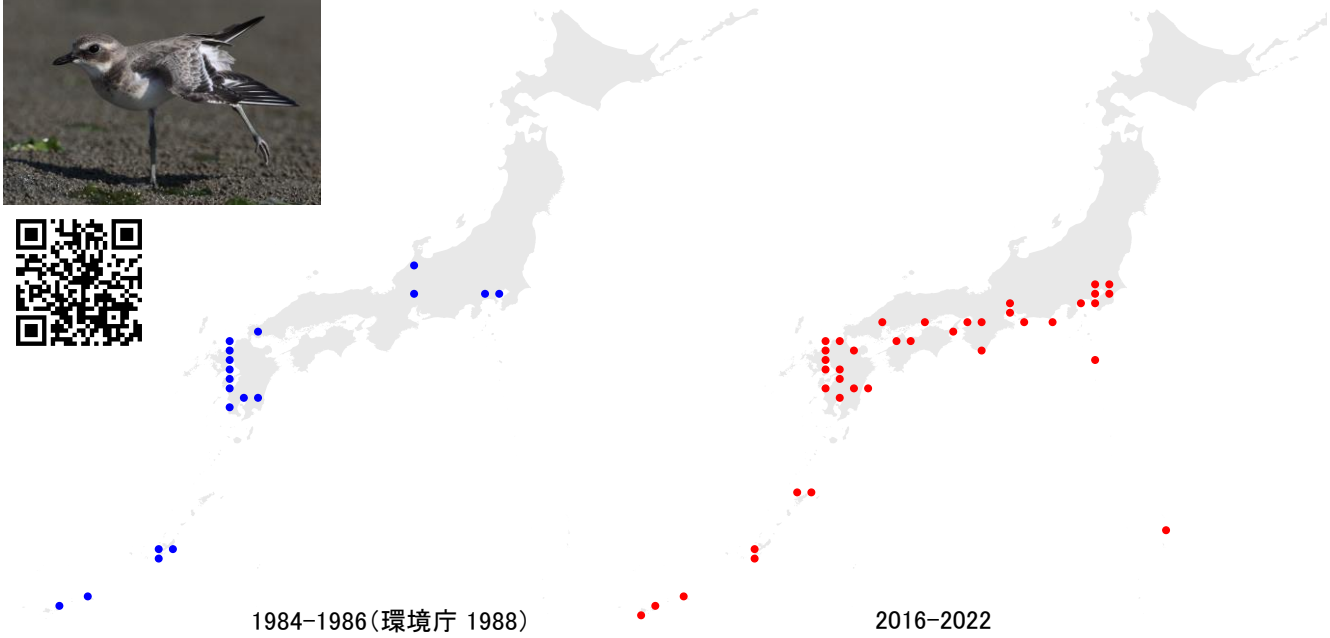
Little Ringed Plover *Charadrius dubius* Length: 14-17cm Weight: ♂36.8±1.9g ♀38.4±2.7g



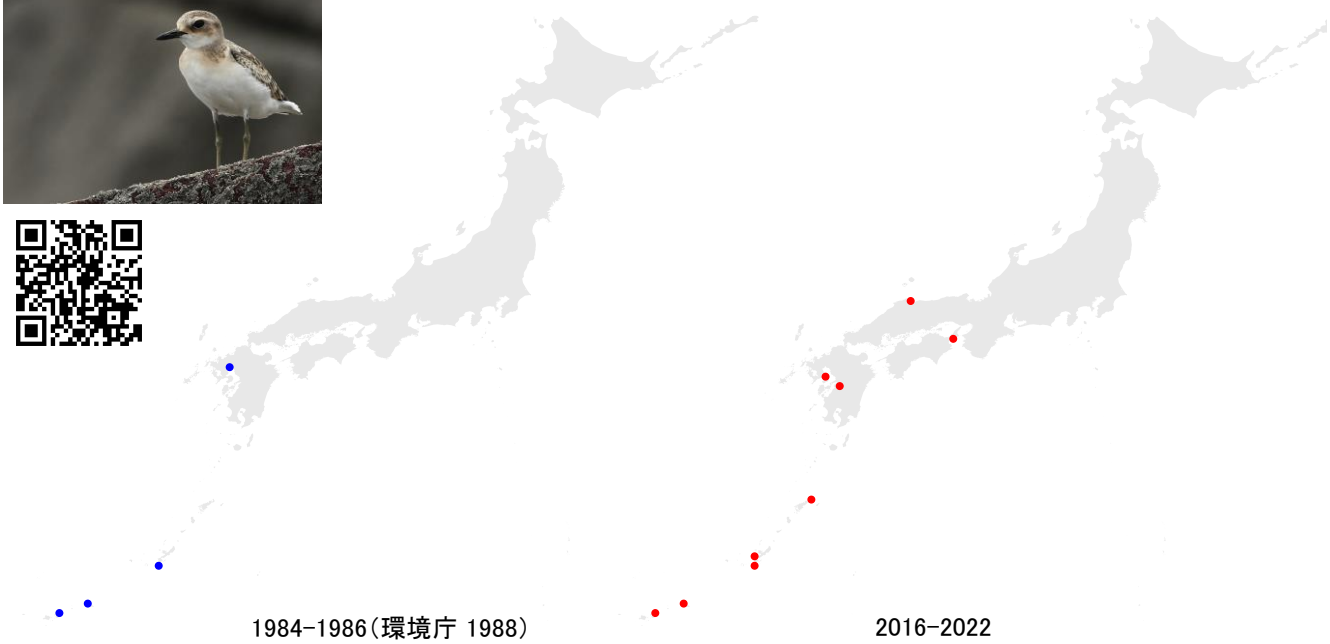
Kentish Plover *Charadrius alexandrinus* Length: 15.0-17.5cm Weight: 32-56g



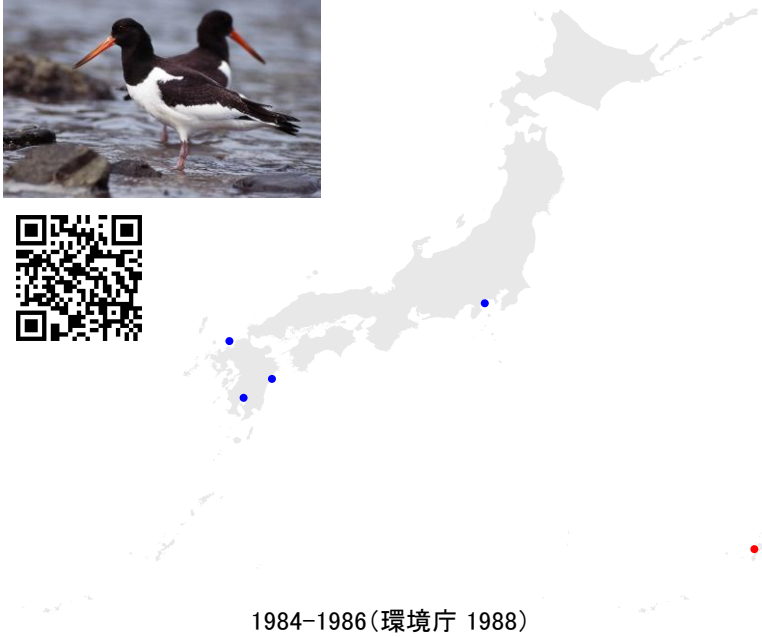
Lesser Sand Plover *Charadrius mongolus* Length: 17.8-20.7cm Weight: 45.0-88.1g



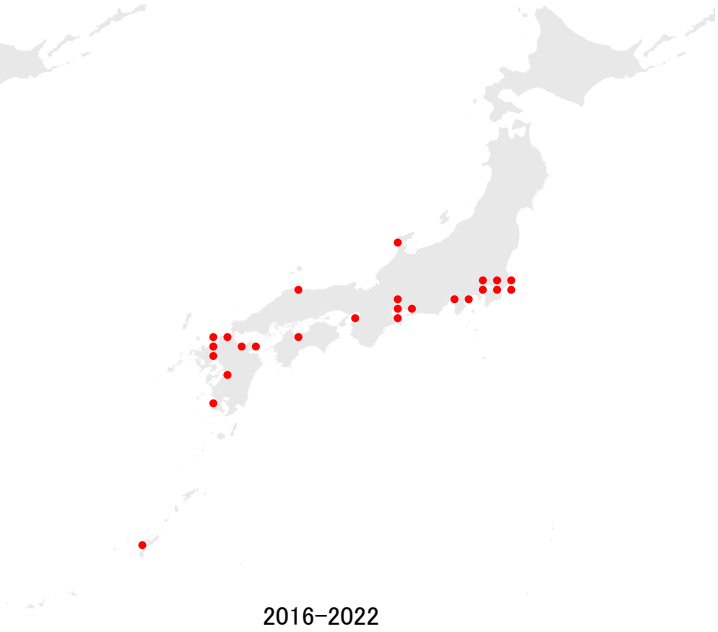
Greater Sand Plover *Charadrius leschenaultii* Length: 22-25cm Weight: 73-100g



Eurasian Oystercatcher *Haematopus ostralegus* Length: 41.8-48.0cm Weight: 487.5-642.8g

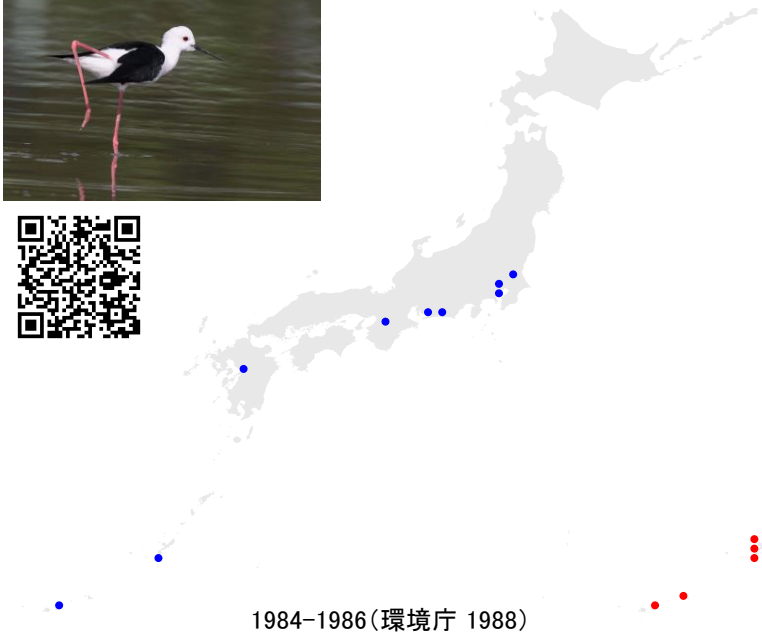


1984–1986（環境庁 1988）

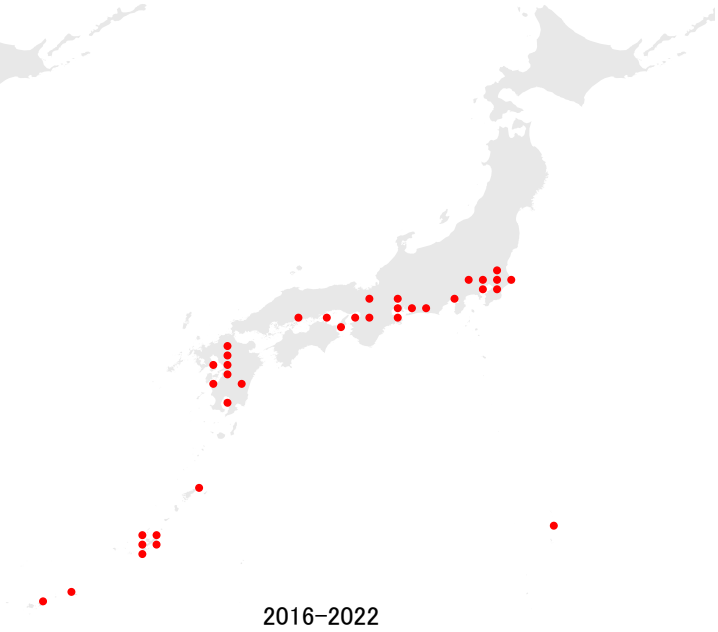


2016–2022

Black-winged Stilt *Himantopus himantopus* Length: 35.0-40.0cm Weight: 112–223g

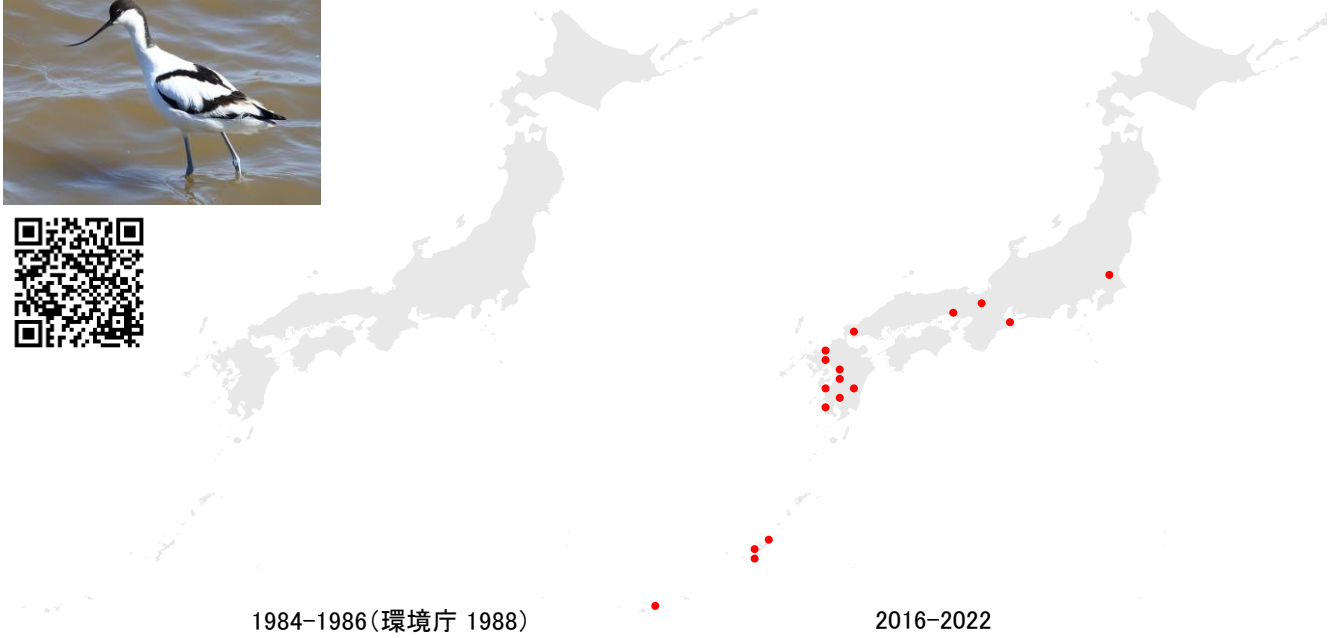


1984–1986（環境庁 1988）

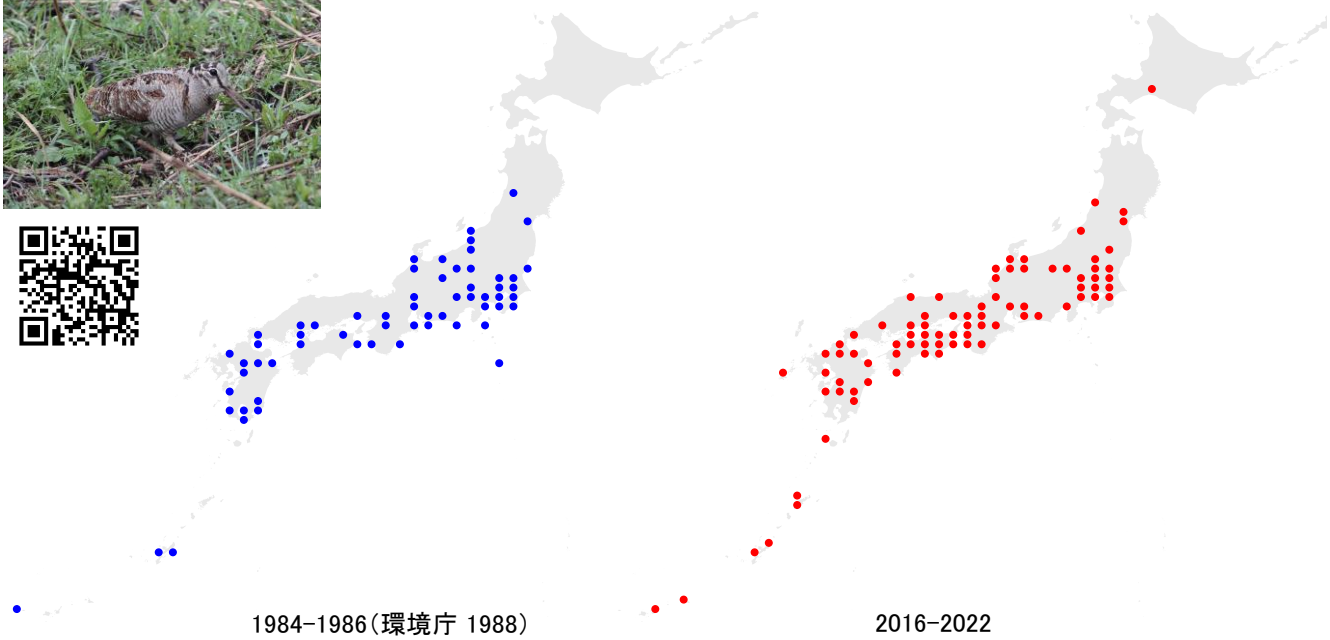


2016–2022

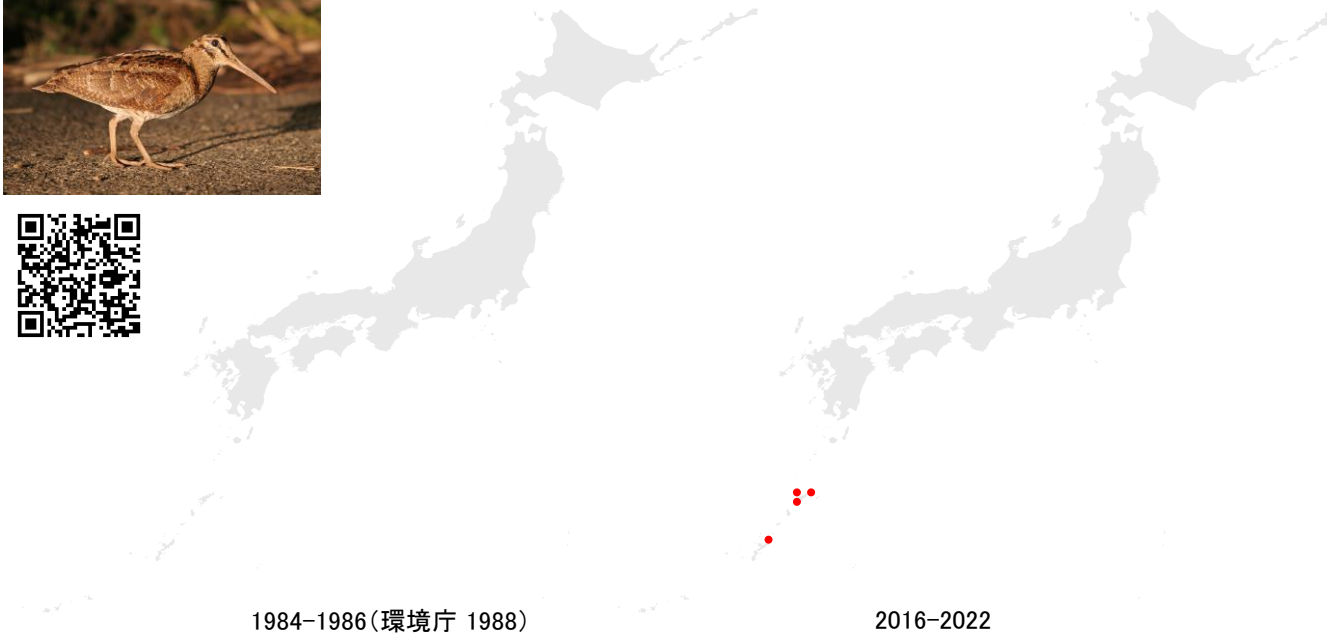
Pied Avocet *Recurvirostra avosetta* Length: 43cm Weight: 225-397g



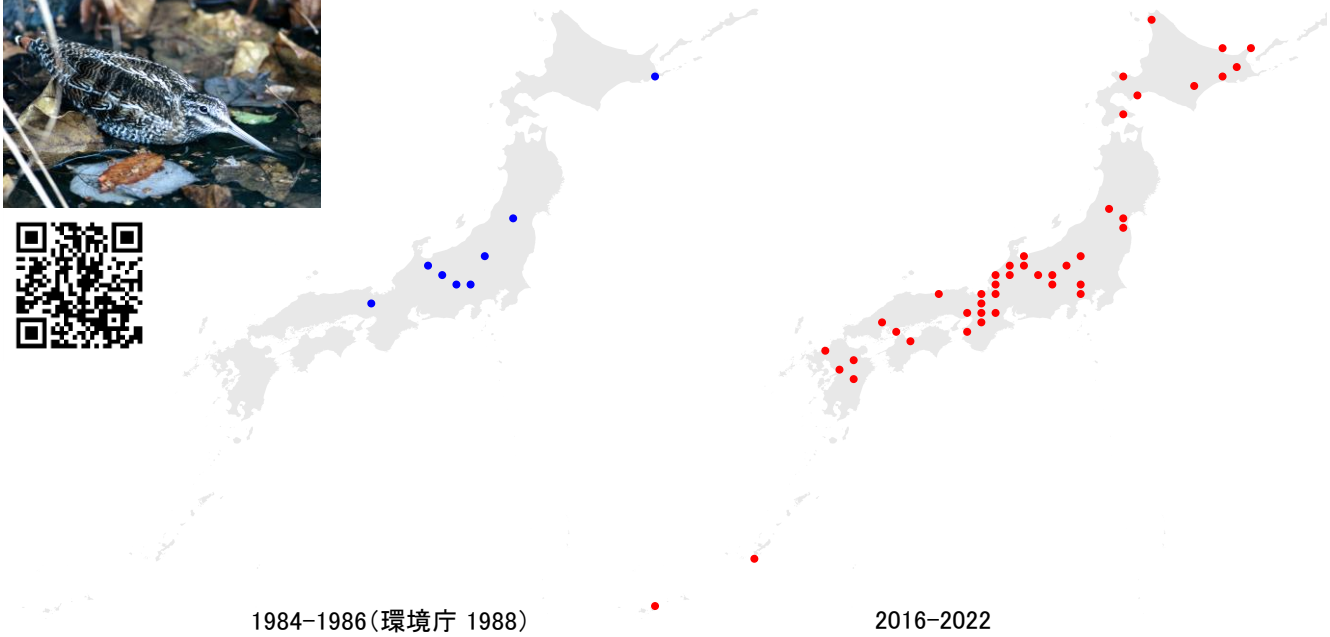
Eurasian Woodcock *Scolopax rusticola* Length: 32.0-34.5cm Weight: 271-375g



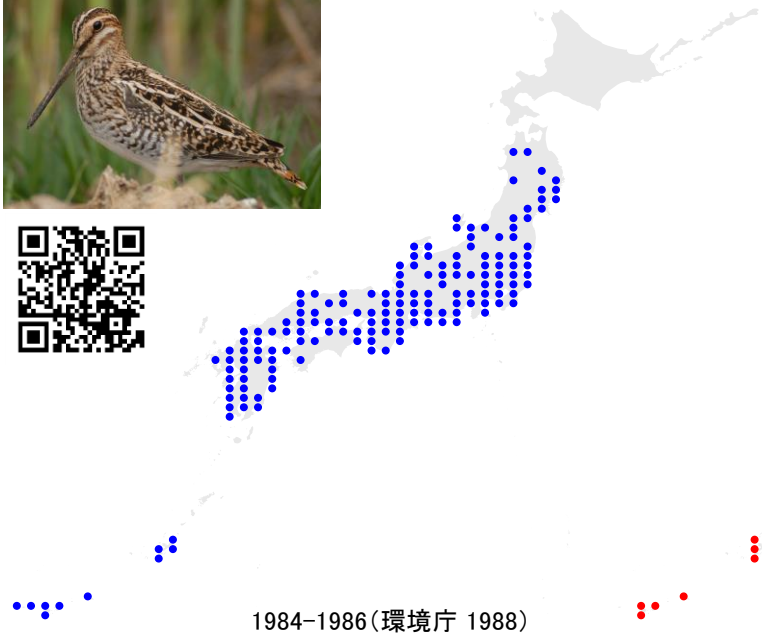
Amami Woodcock *Scolopax mira* Length: 36cm Weight: 400-500g



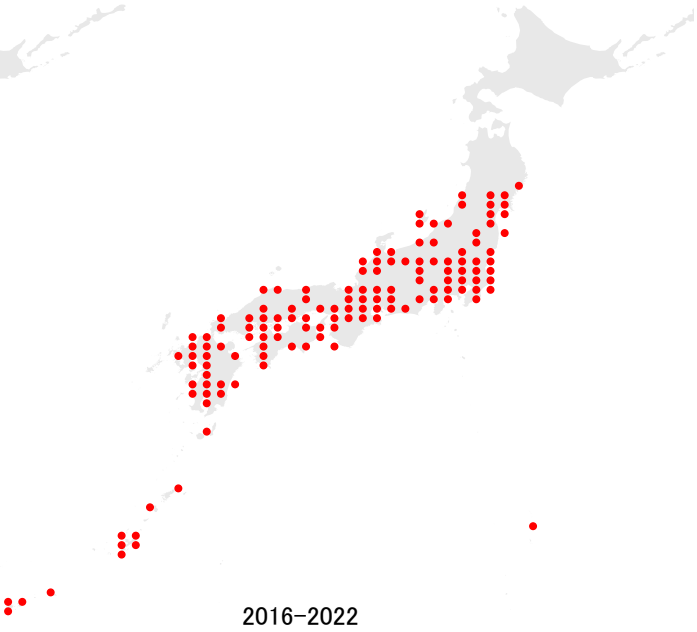
Solitary Snipe *Gallinago solitaria* Length: 30cm Weight: 127-245g



Common Snipe *Gallinago gallinago* Length: 24.2-28.9cm Weight: 74.6-140.6g

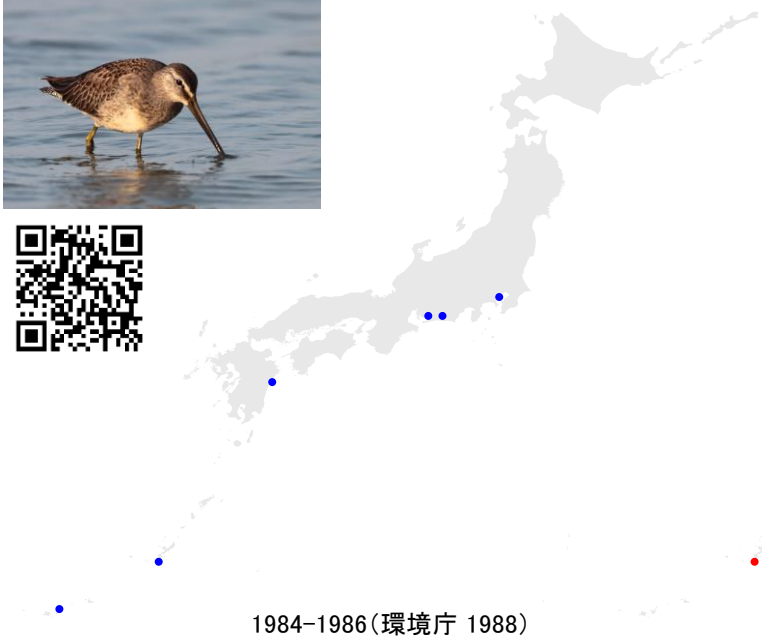


1984-1986（環境庁 1988）

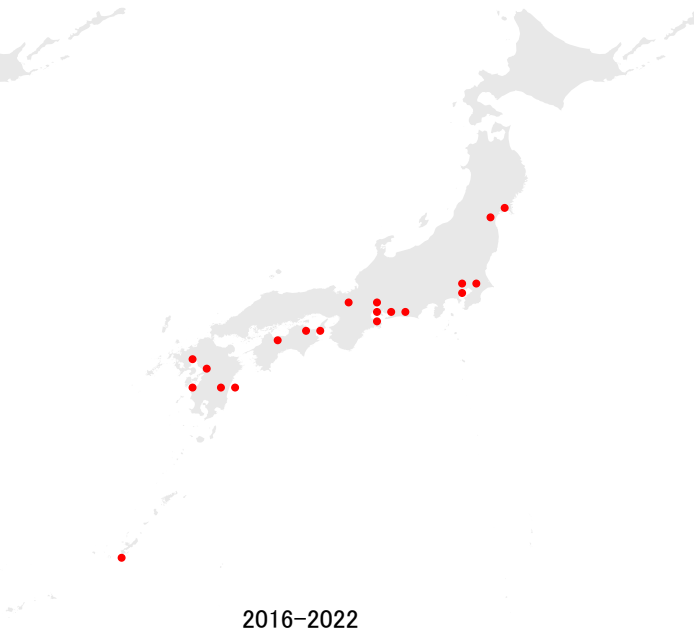


2016-2022

Long-billed Dowitcher *Limnodromus scolopaceus* Length: 25-29cm Weight: 90-135g

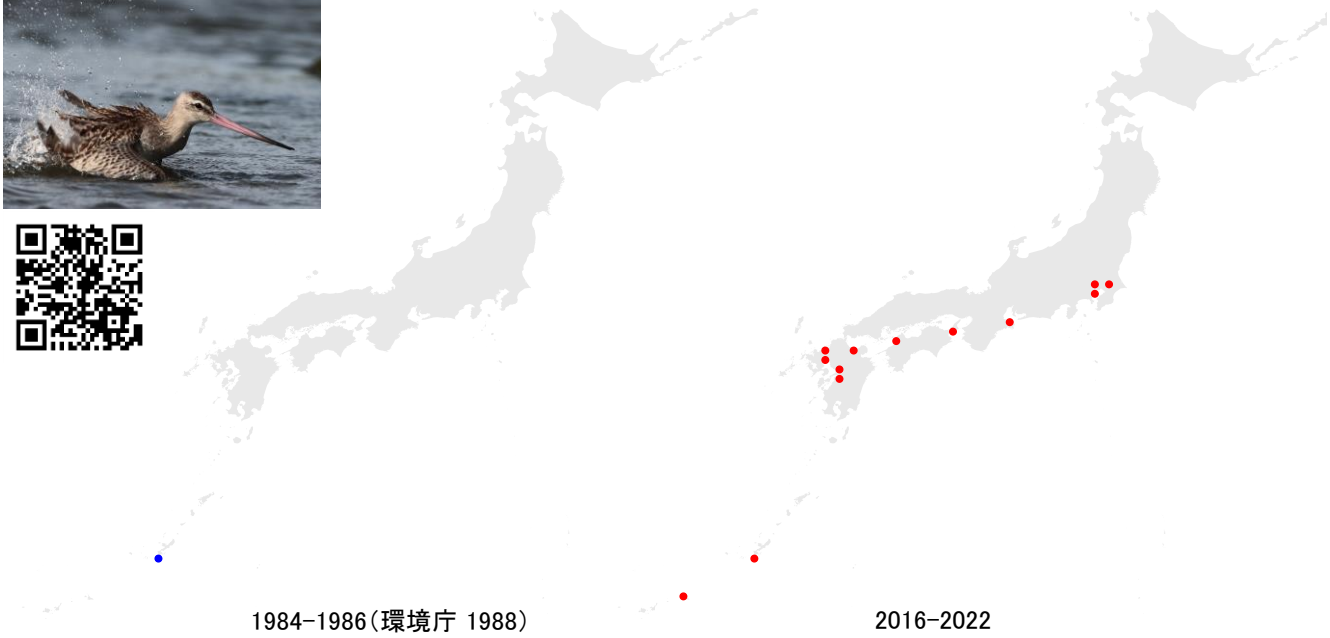


1984-1986（環境庁 1988）

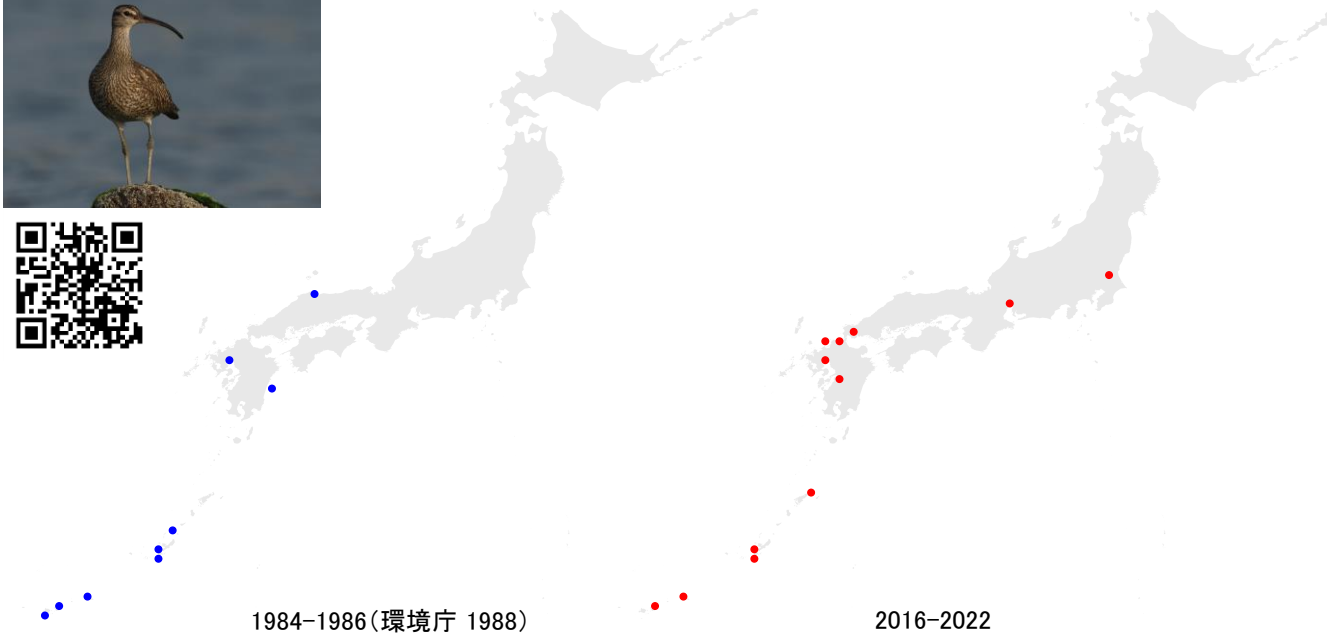


2016-2022

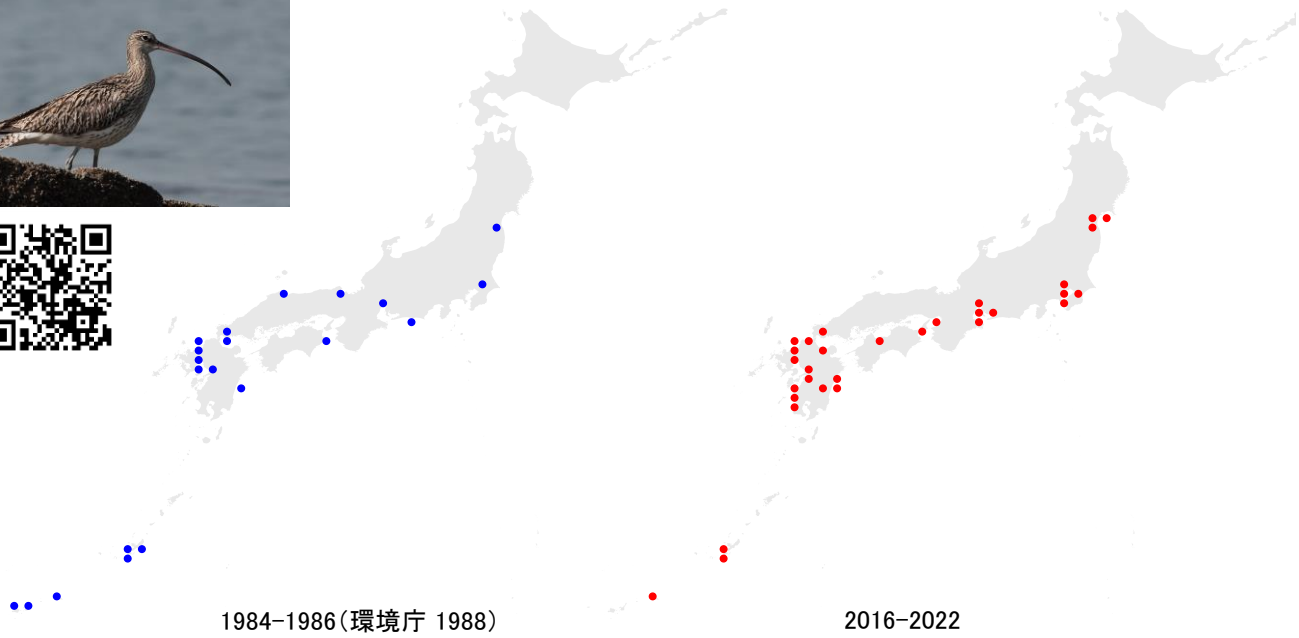
Bar-tailed Godwit *Limosa lapponica* Length: 33-39cm Weight: 187-438g



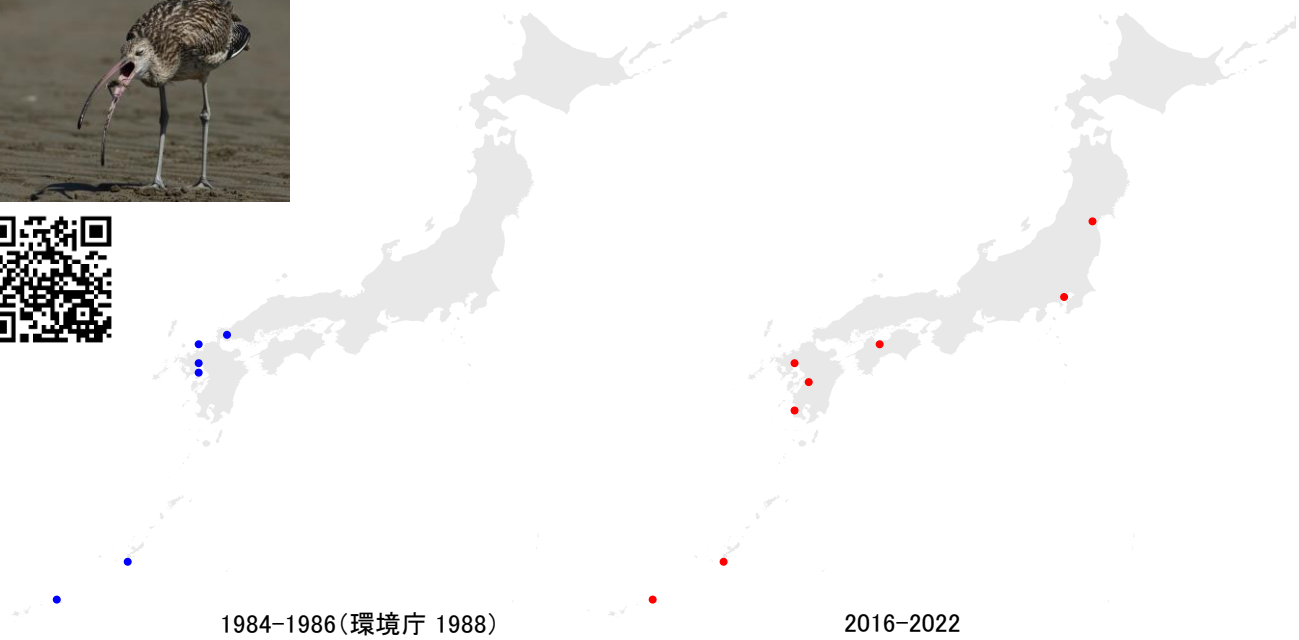
Eurasian Whimbrel *Numenius phaeopus* Length: 39.6-44.6cm Weight: 276.0-517.5g



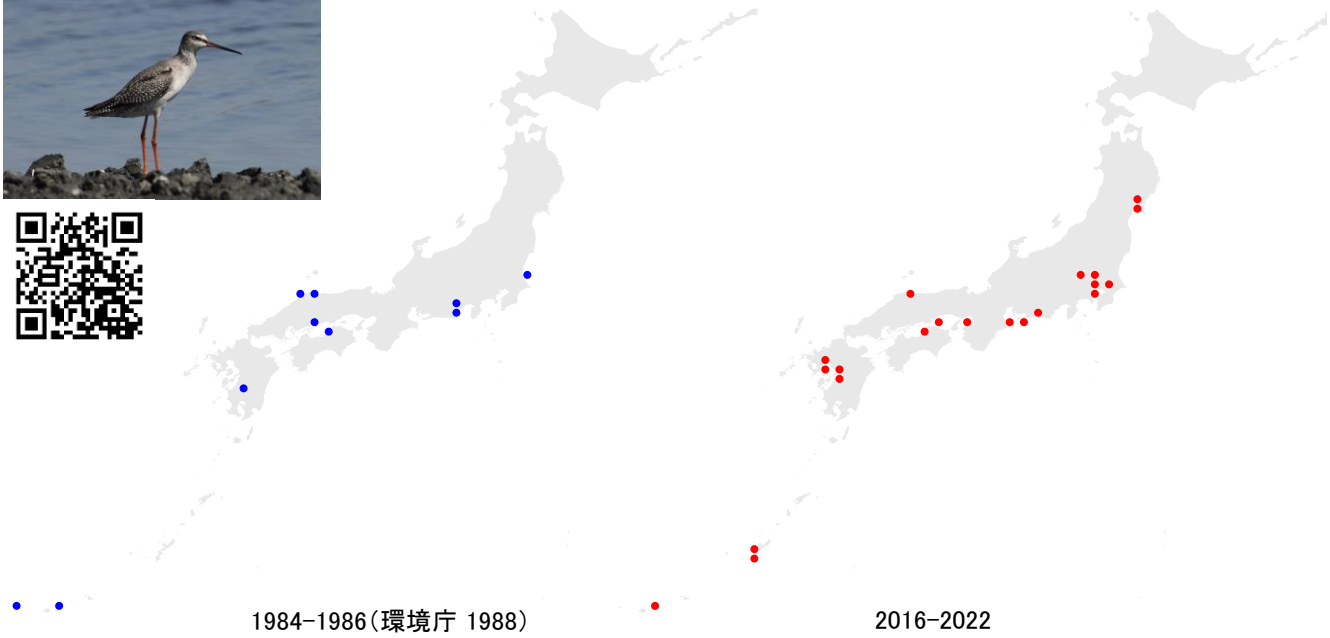
Eurasian Curlew *Numenius arquata* Length: 52-66cm Weight: 555.8-1088.6g



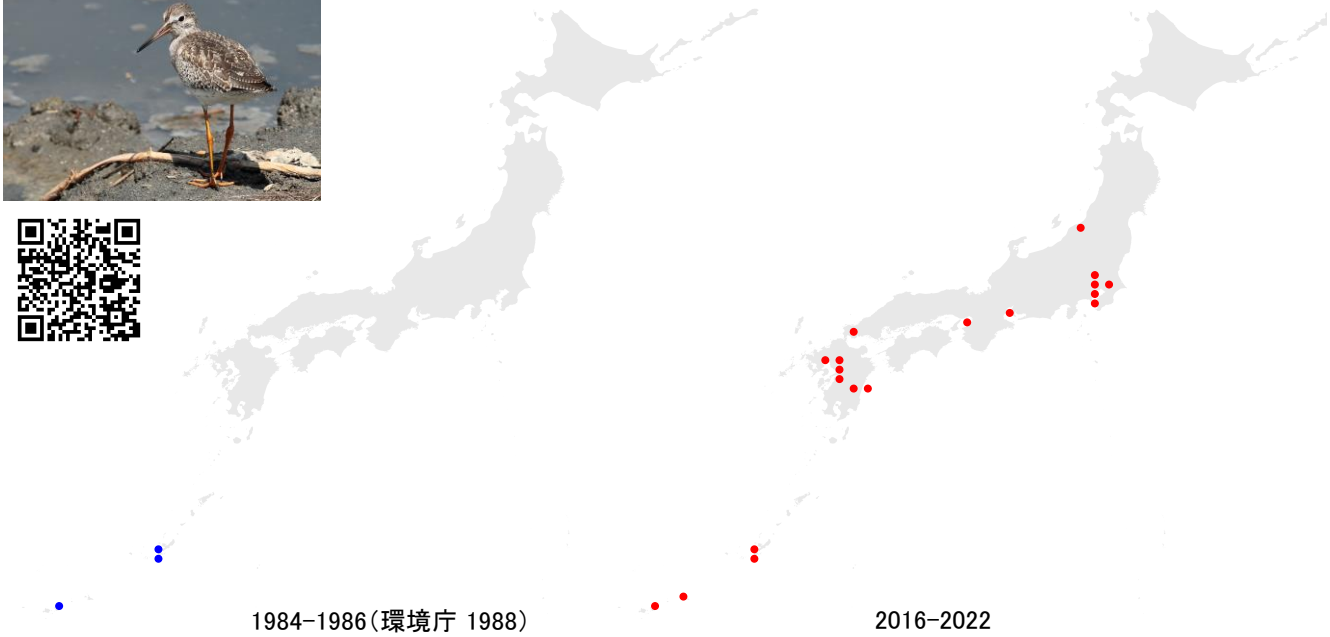
Far Eastern Curlew *Numenius madagascariensis* Length: 53.5-68.0cm Weight: 740-1301g



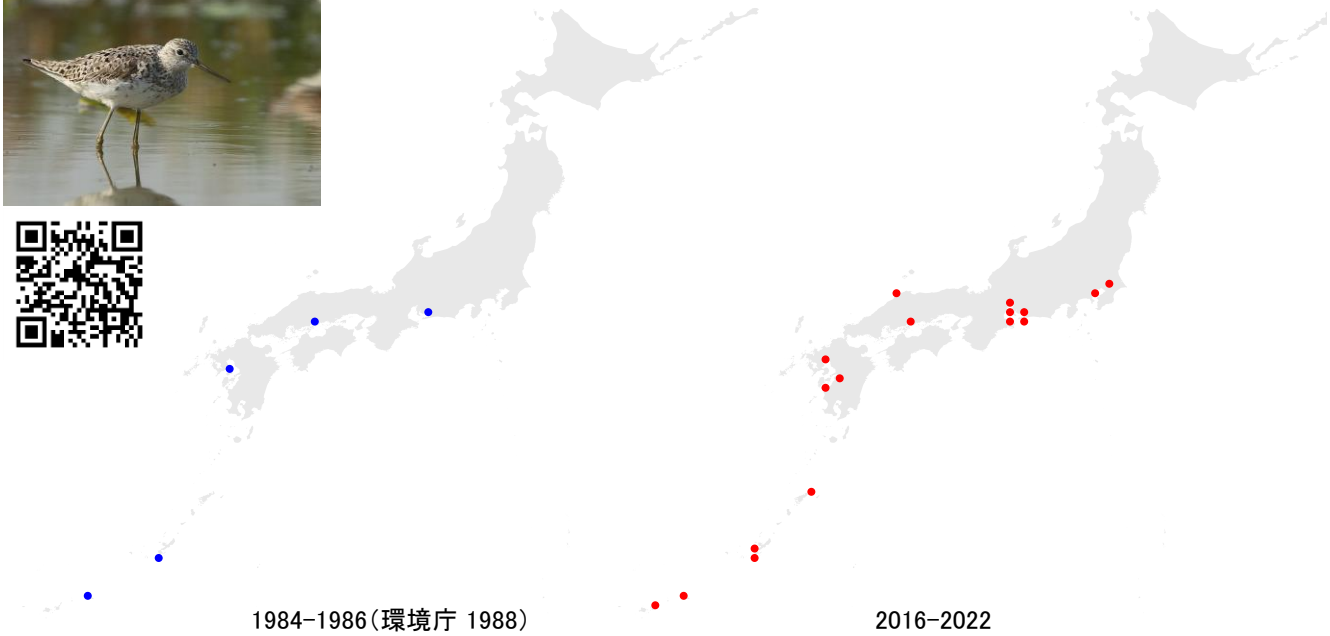
Spotted Redshank *Tringa erythropus* Length: 30.5-33.7cm Weight: 117-182.6g



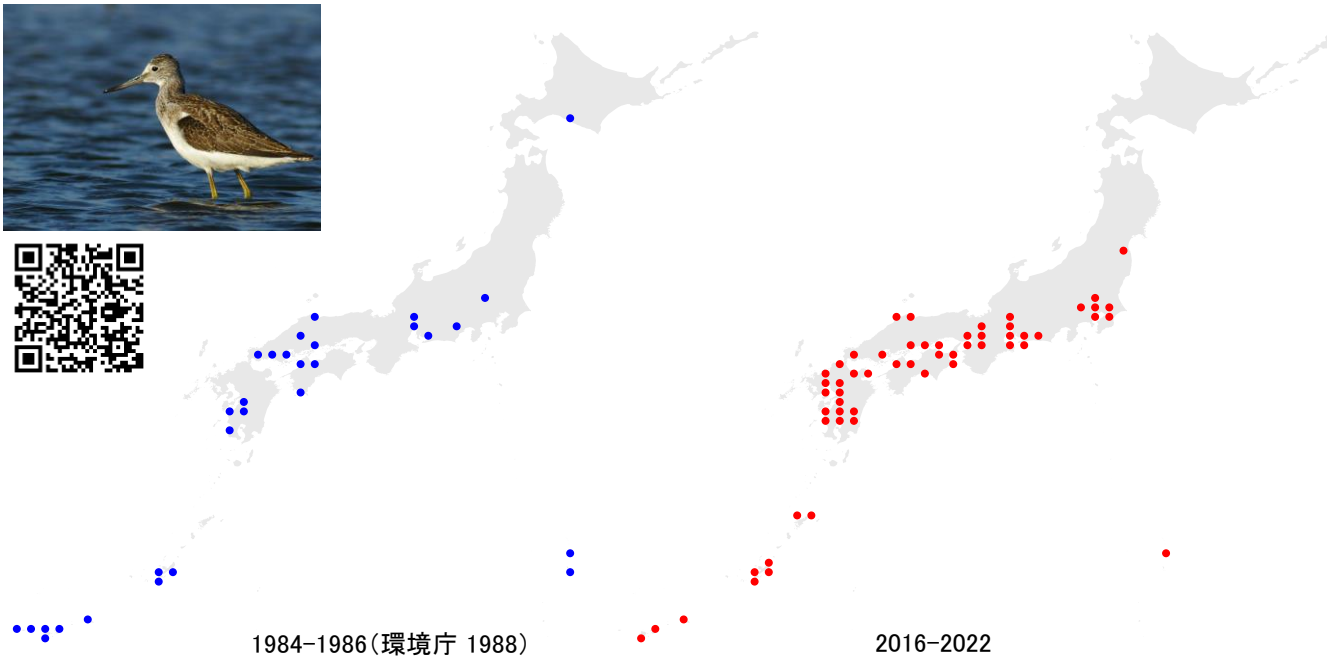
Common Redshank *Tringa totanus* Length: 25.4-29.2cm Weight: 105.8-157.5g



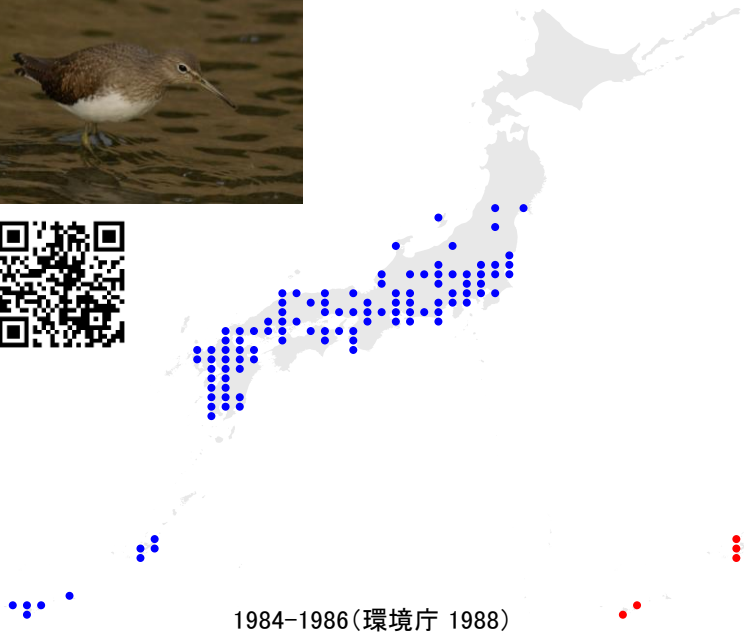
Marsh Sandpiper *Tringa stagnatilis* Length: 24cm Weight: 55-120g



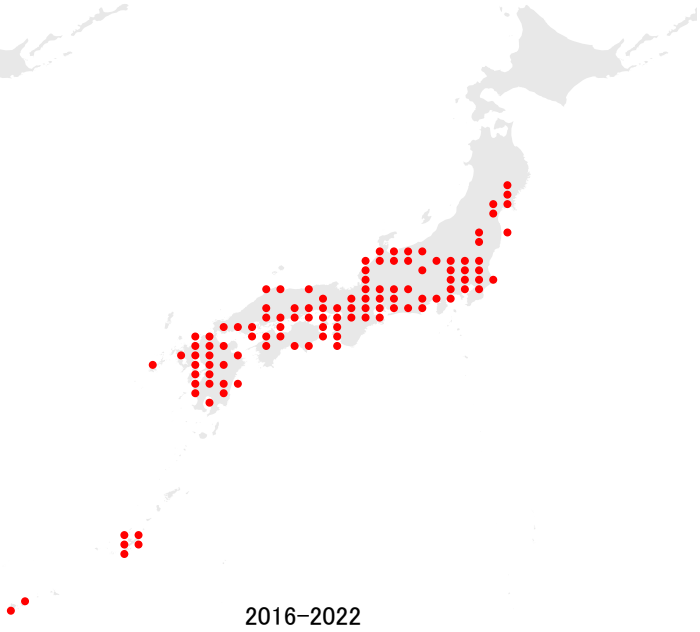
Common Greenshank *Tringa nebularia* Length: 31.8-36.7cm Weight: 147.8-223.9g



Green Sandpiper *Tringa ochropus* Length: 22.7-25.4cm Weight: 72.0-105.4g

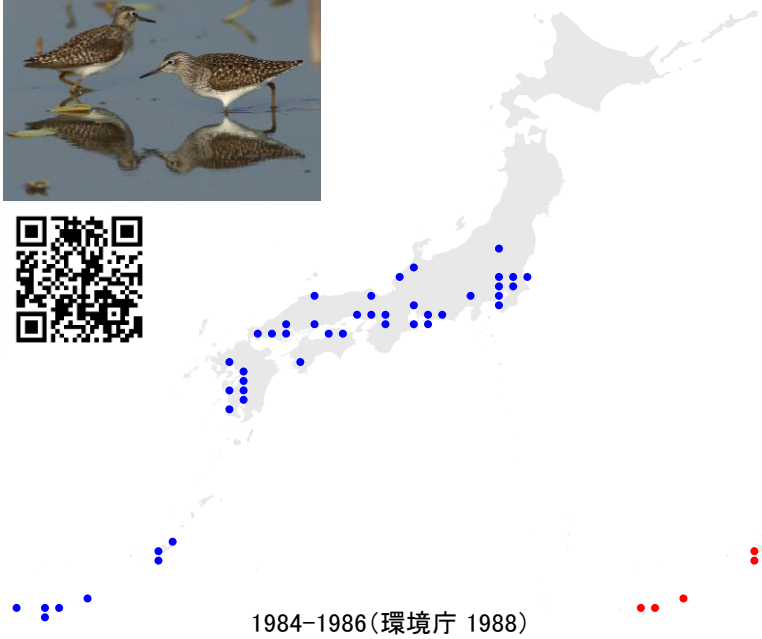


1984–1986（環境庁 1988）

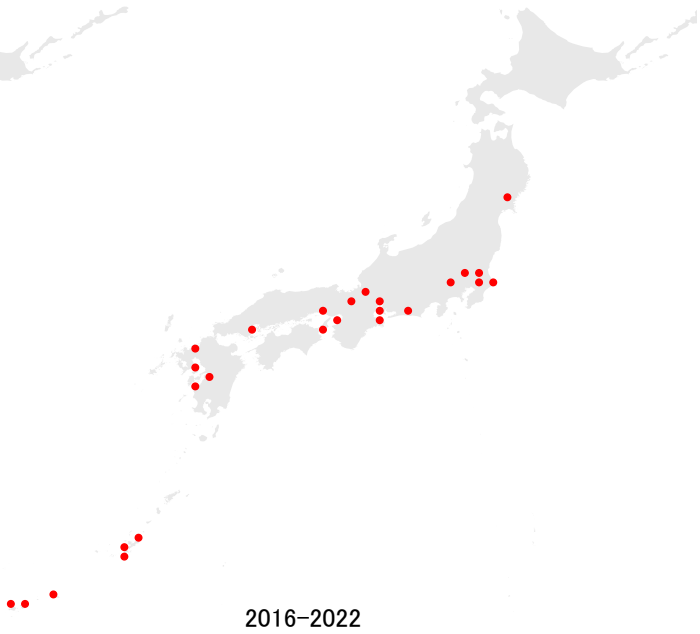


2016–2022

Wood Sandpiper *Tringa glareola* Length: 20.3-22.8cm Weight: 53.6-81.8g

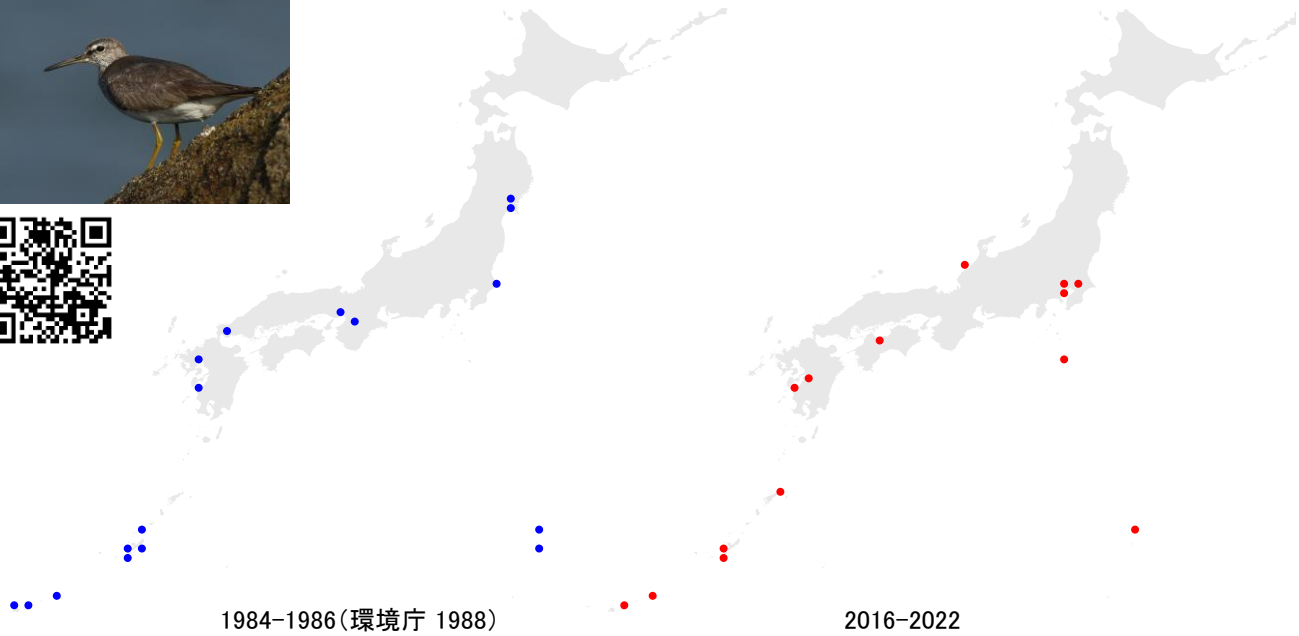


1984–1986（環境庁 1988）

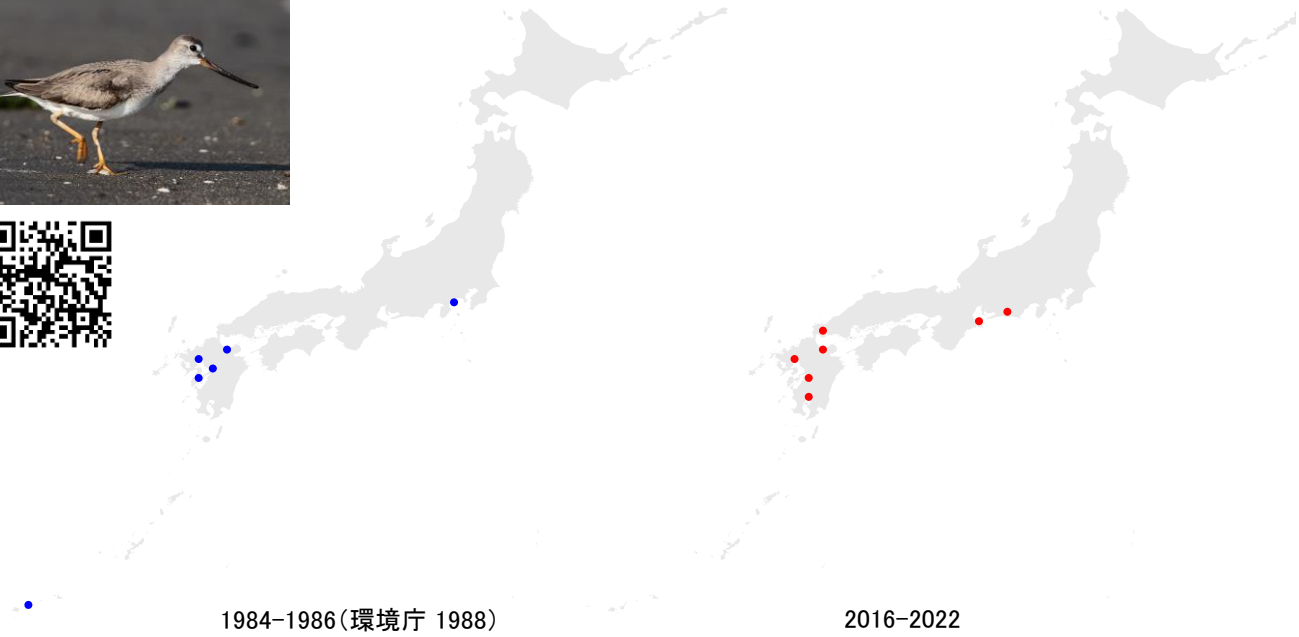


2016–2022

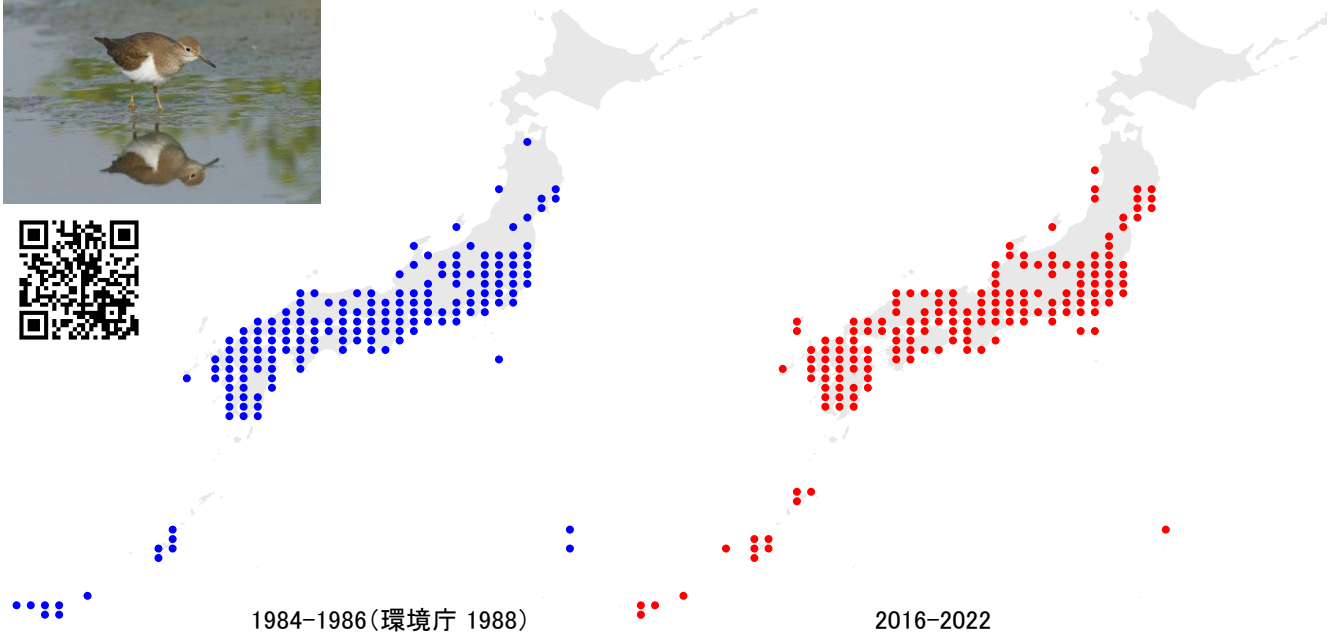
Grey-tailed Tattler *Heteroscelus brevipes* Length: 24.1-28.5cm Weight: 75.4-171.0g



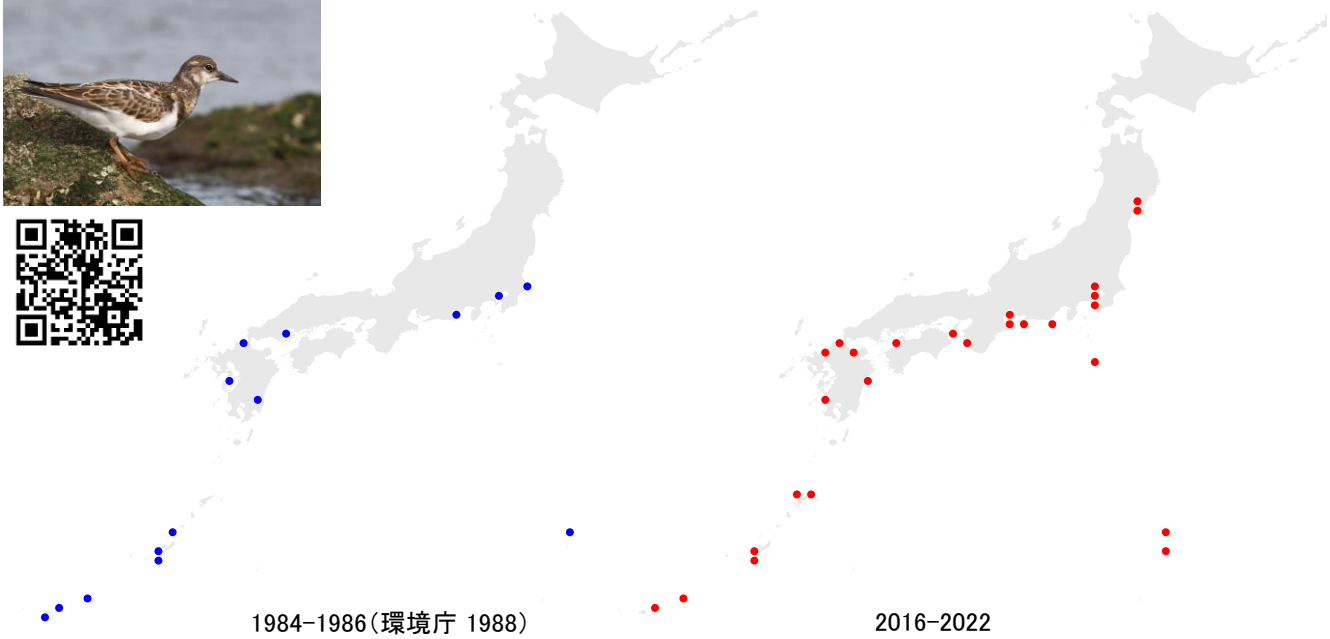
Terek Sandpiper *Xenus cinereus* Length: 21.2-24.5cm Weight: 65.3-111.8g



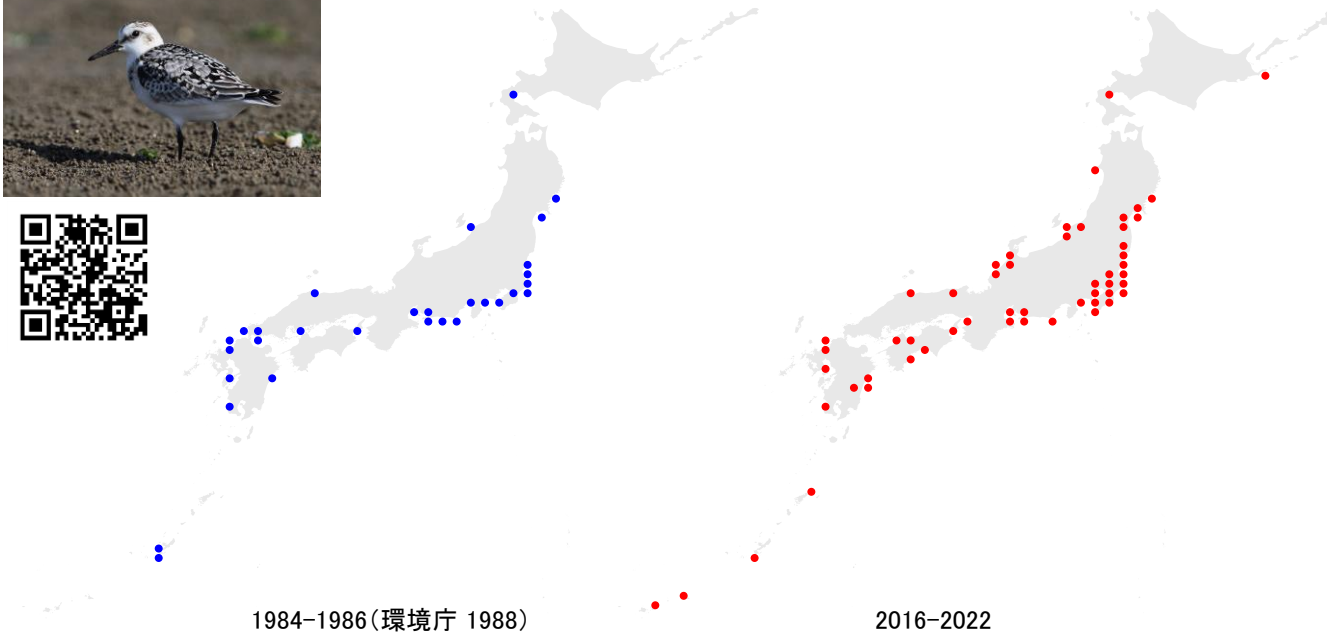
Common Sandpiper *Actitis hypoleucos* Length: 17.8-21.0cm Weight: 45.0-94.1g



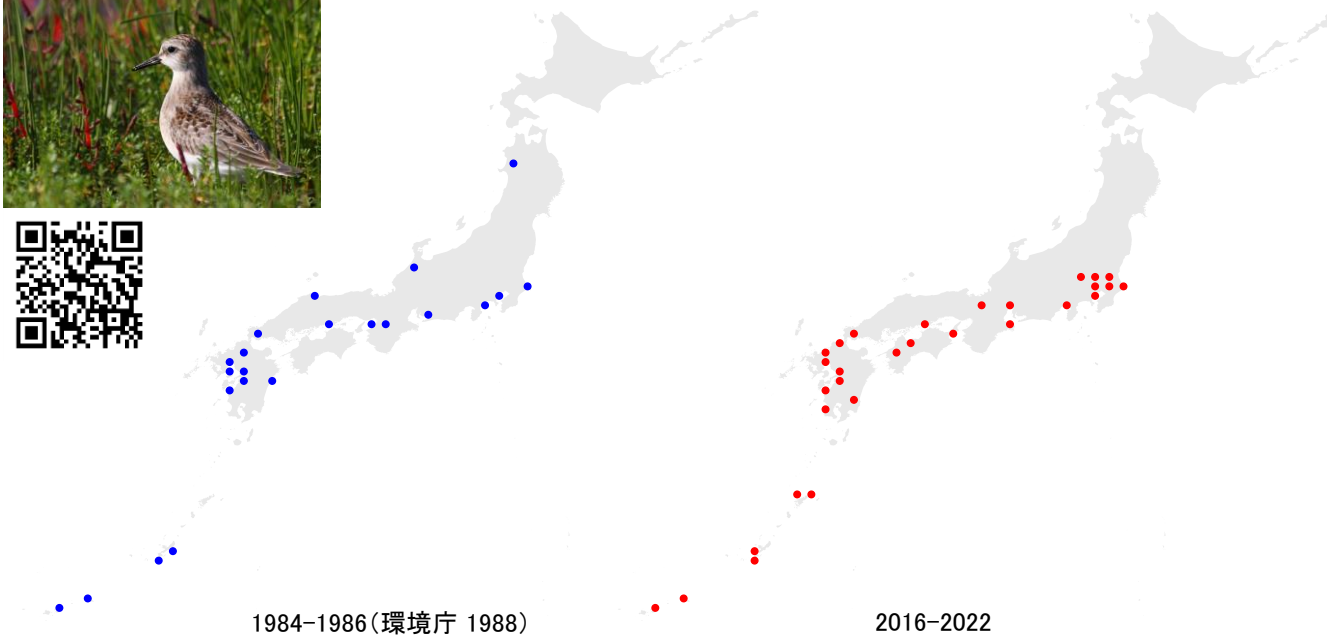
Ruddy Turnstone *Arenaria interpres* Length: 20.5-24.0cm Weight: 97.5-176.3g



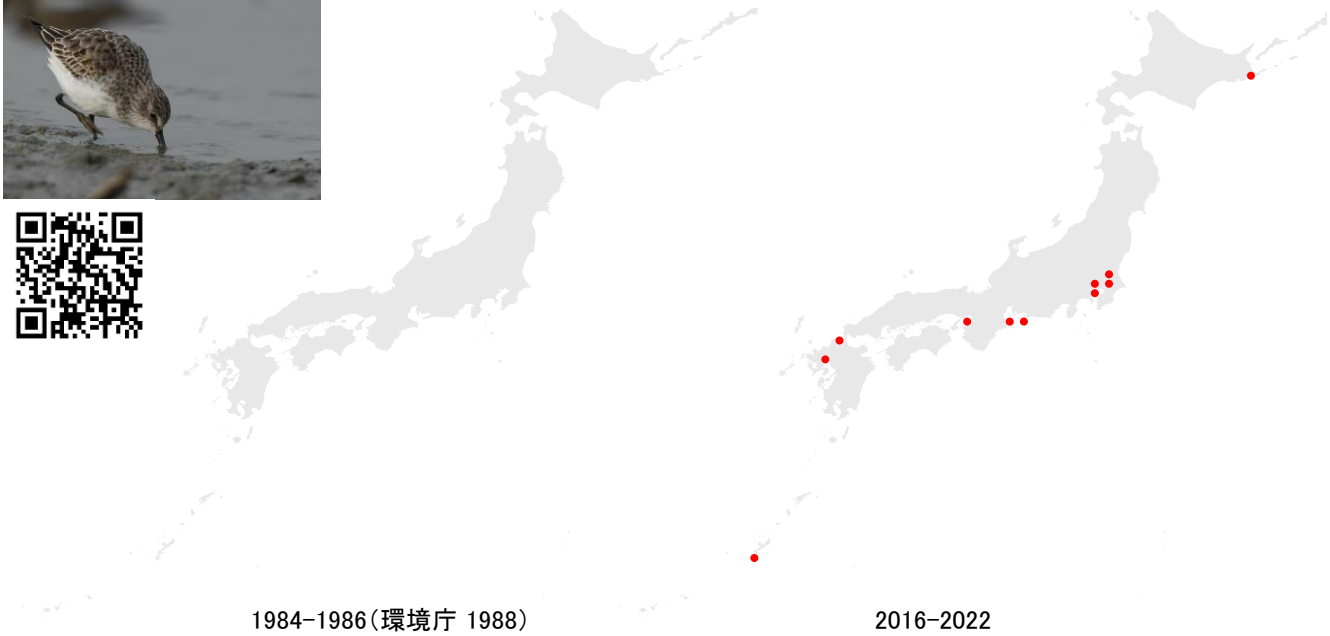
Sanderling *Calidris alba* Length: 20.0-21.0cm Weight: ♂44-75g ♀50-67g



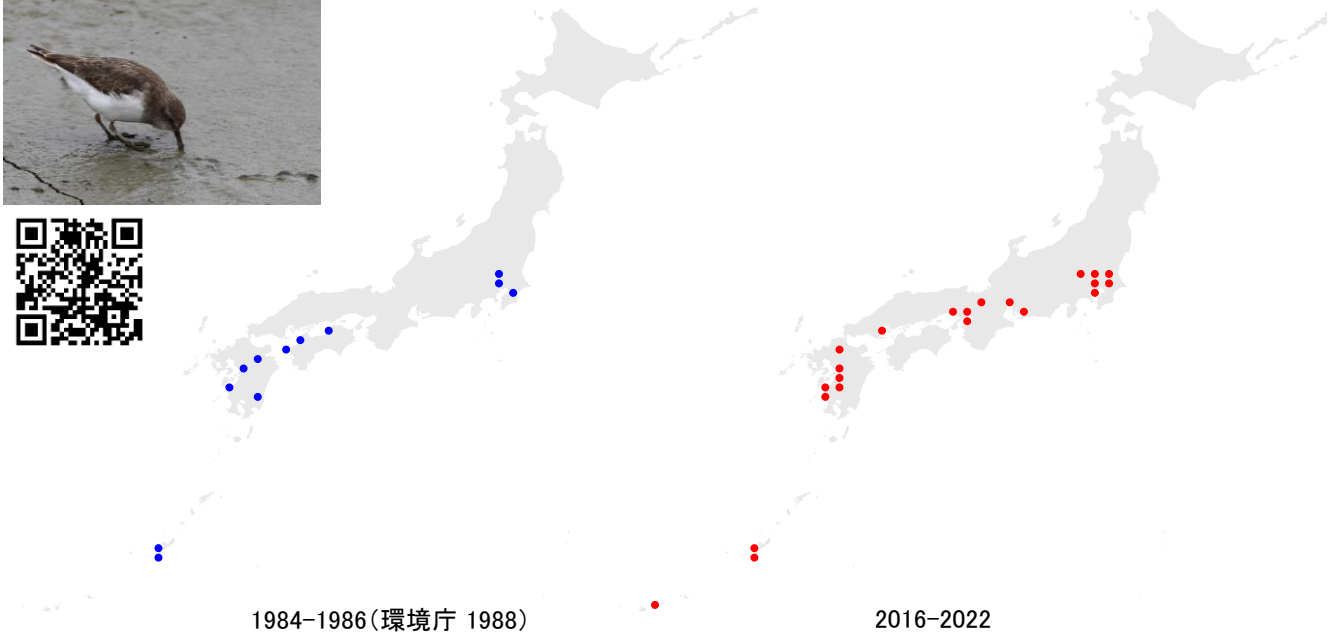
Red-necked Stint *Calidris ruficollis* Length: 13.5-16.4cm Weight: 19.5-47.3g



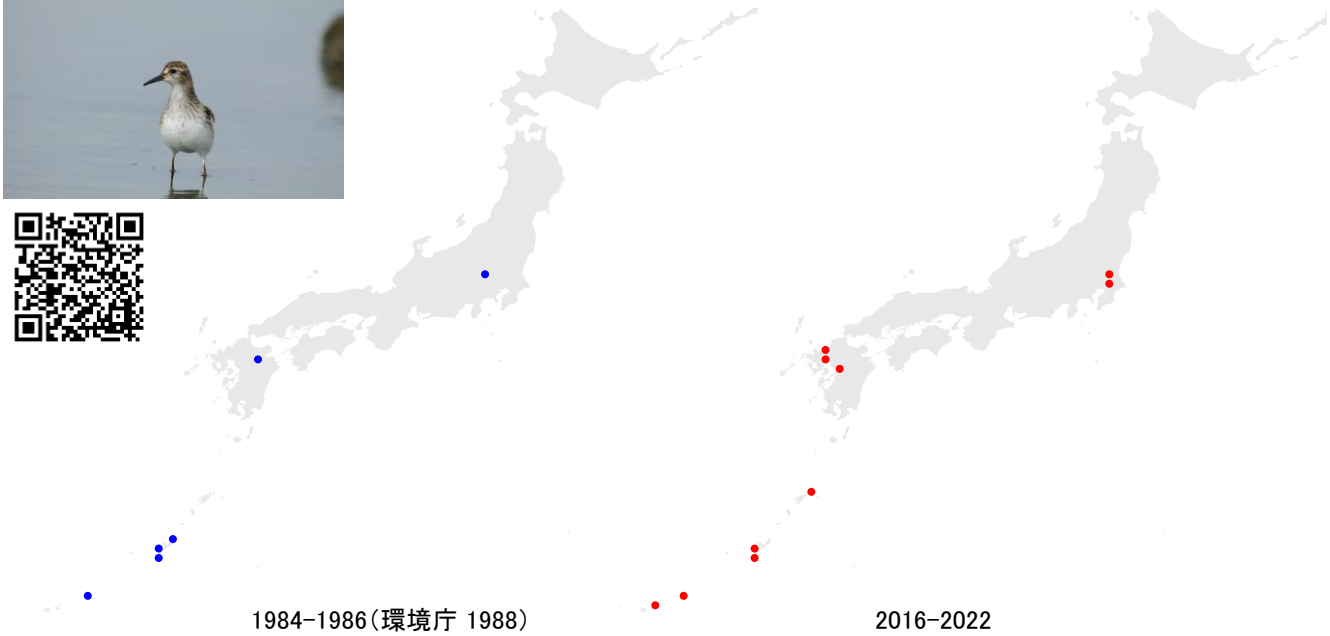
Little Stint *Calidris minuta* Length: 12-14cm Weight: 17-44g



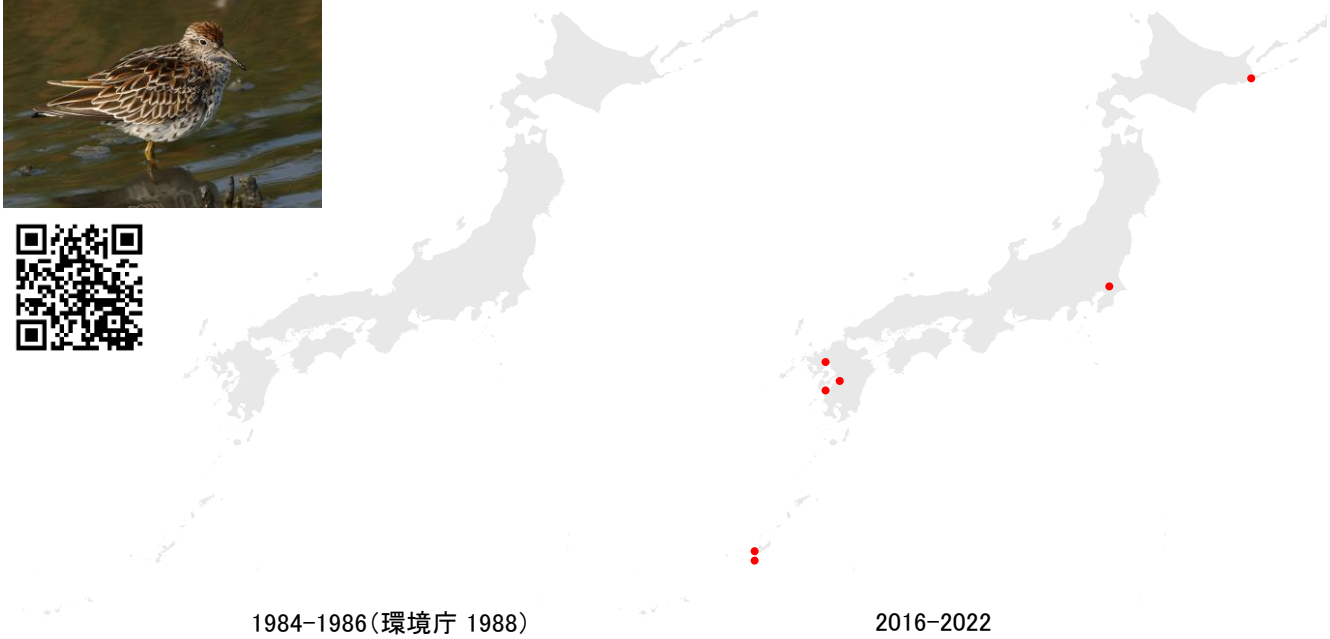
Temminck's Stint *Calidris temminckii* Length: 13-15cm Weight: 16-39g



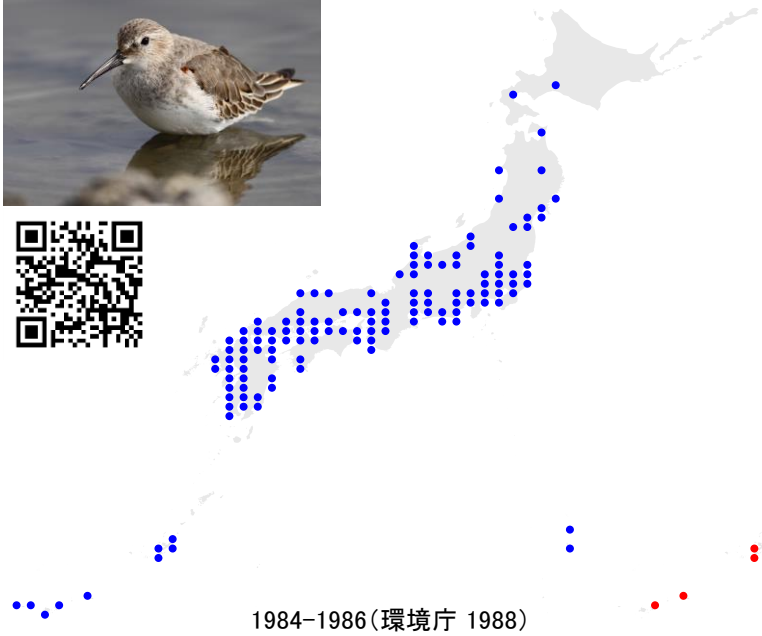
Long-toed Stint *Calidris subminuta* Length: 13-15cm Weight: 23-40g



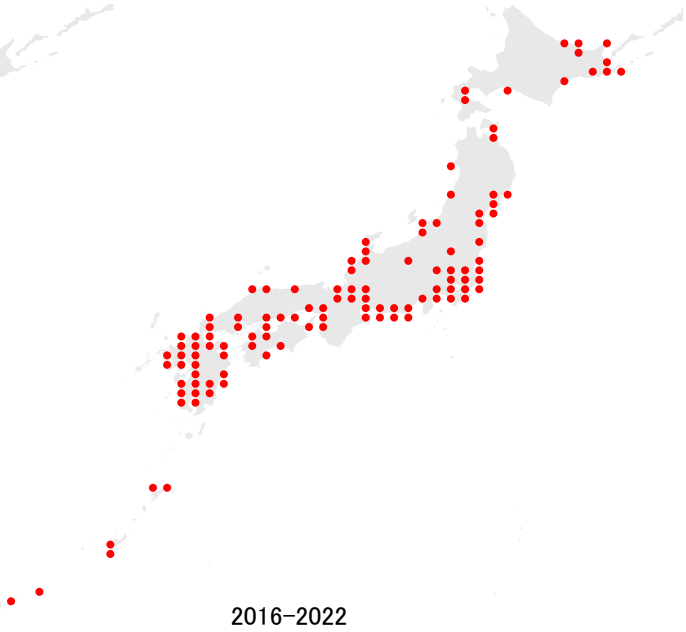
Sharp-tailed Sandpiper *Calidris acuminata* Length: 17-21cm Weight: 42-117g



Dunlin *Calidris alpina* Length: 16-22cm Weight: 37-88g

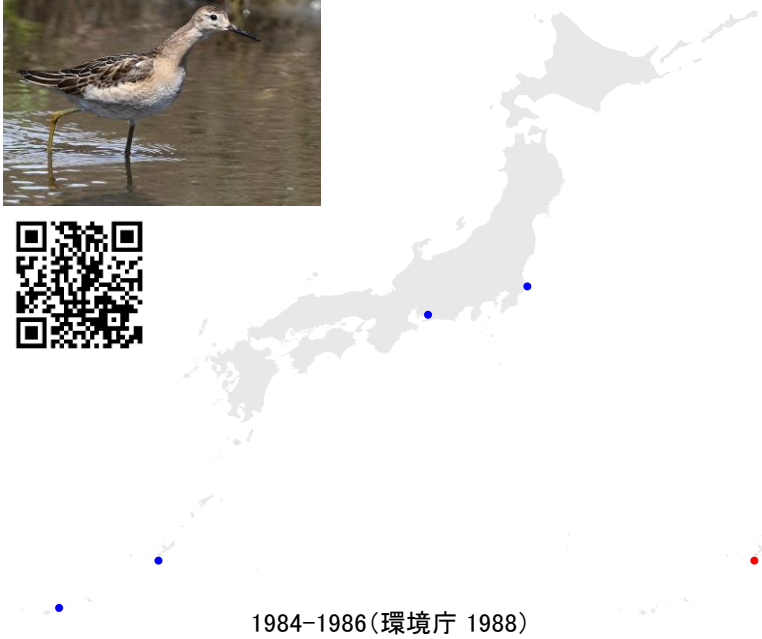


1984–1986（環境庁 1988）

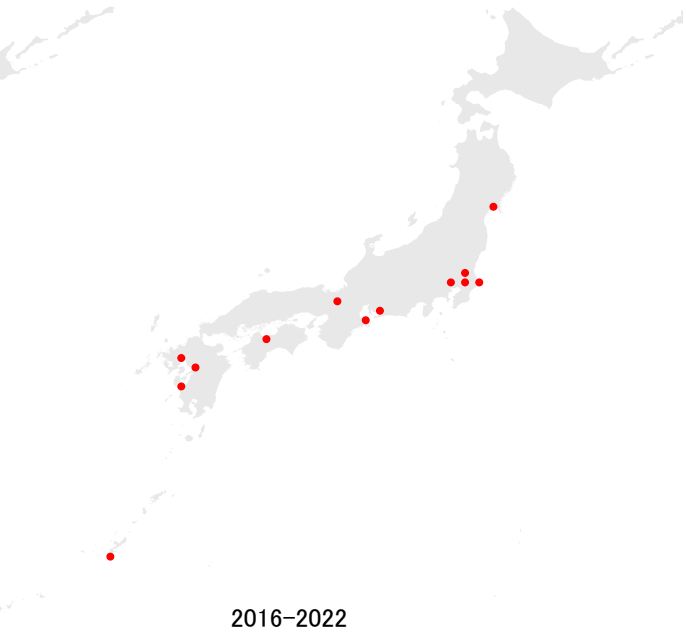


2016–2022

Ruff *Philomachus pugnax* Length: 20-32cm Weight: 130-254g

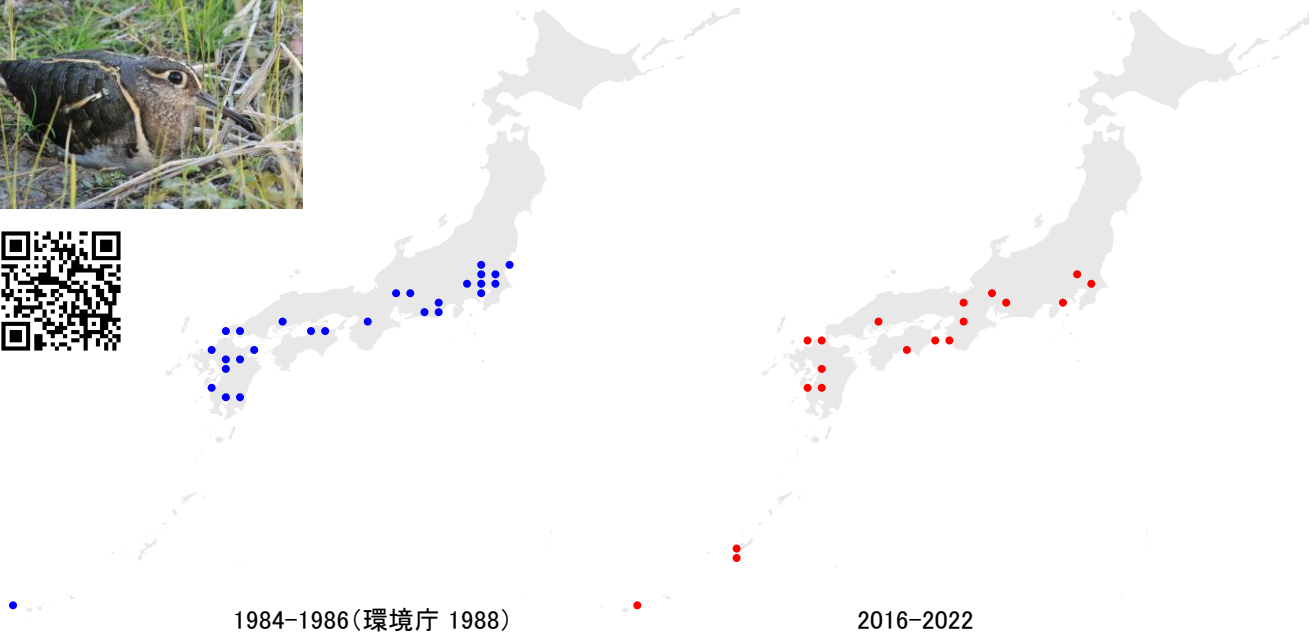


1984–1986（環境庁 1988）

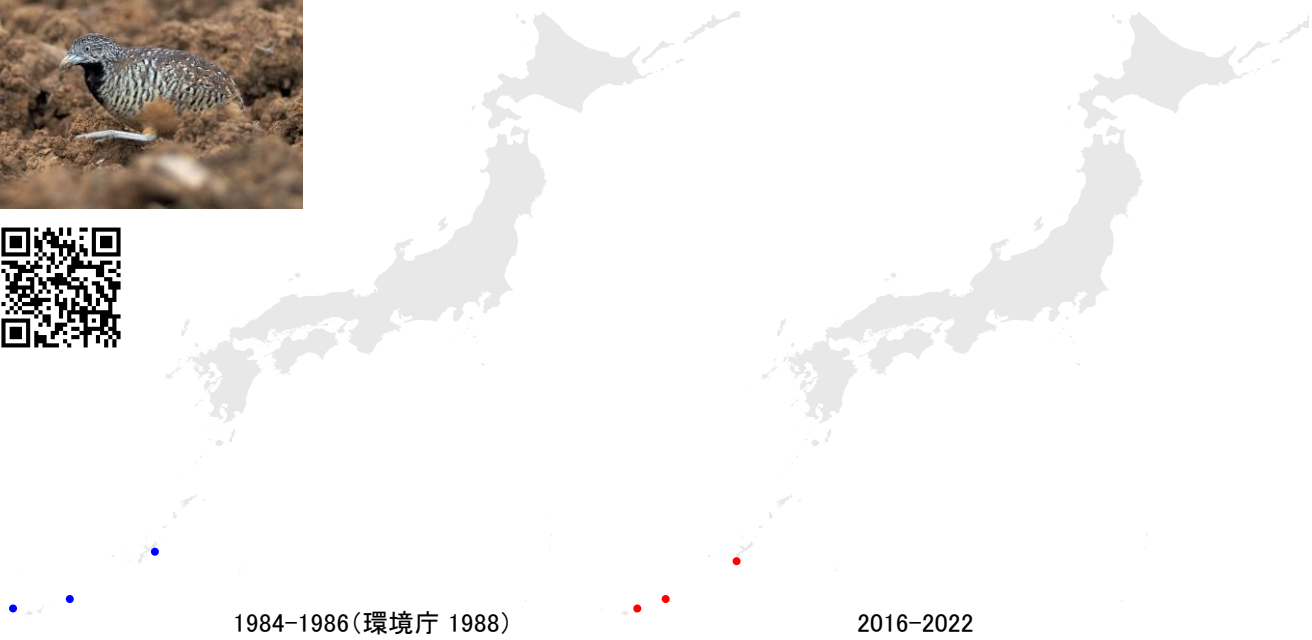


2016–2022

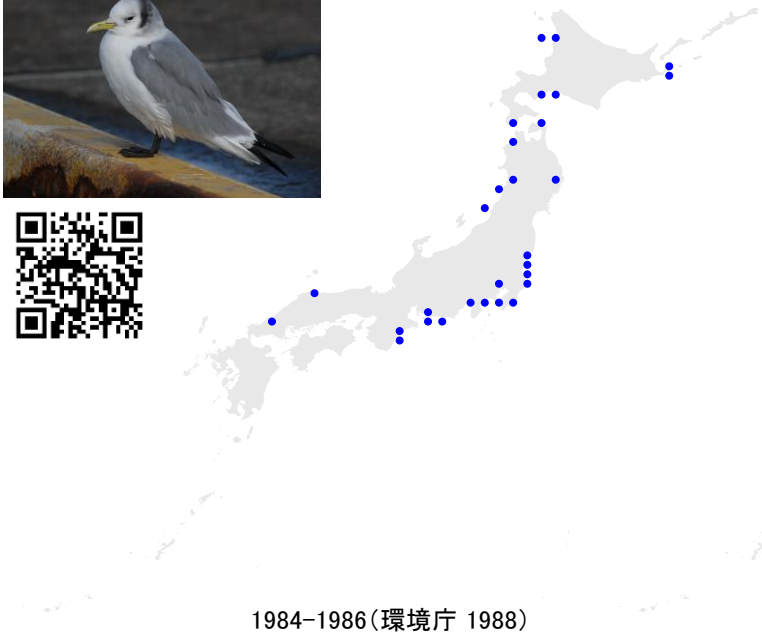
Greater Painted-snipe *Rostratula benghalensis* Length: 22.5-25.0cm Weight: ♂113-155g ♀151-242g



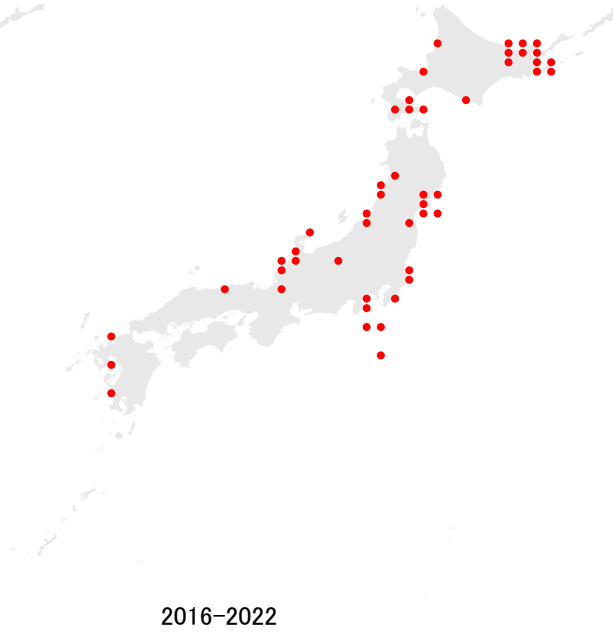
Barred Buttonquail *Turnix suscitator* Length: 14-17cm



Black-legged Kittiwake *Rissa tridactyla* Length: 35.8-40.6cm Weight: 304.9-398.3g

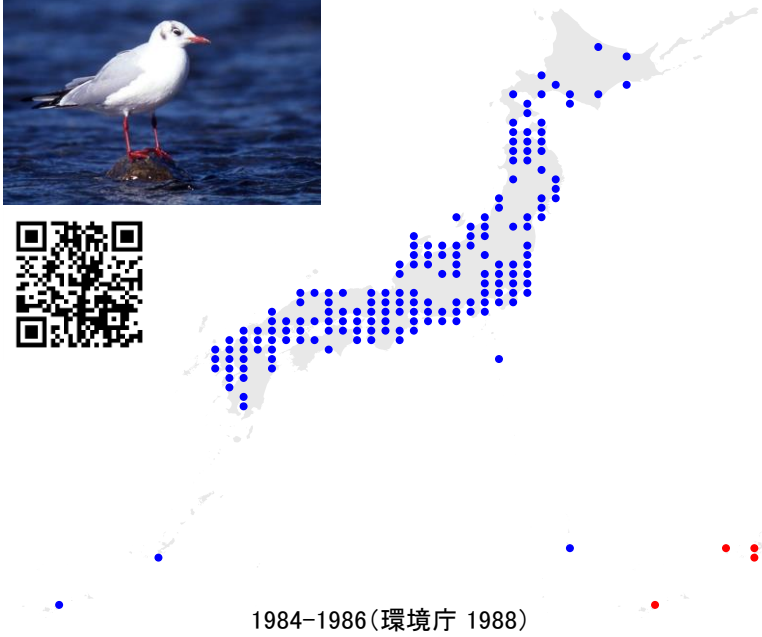


1984–1986（環境庁 1988）

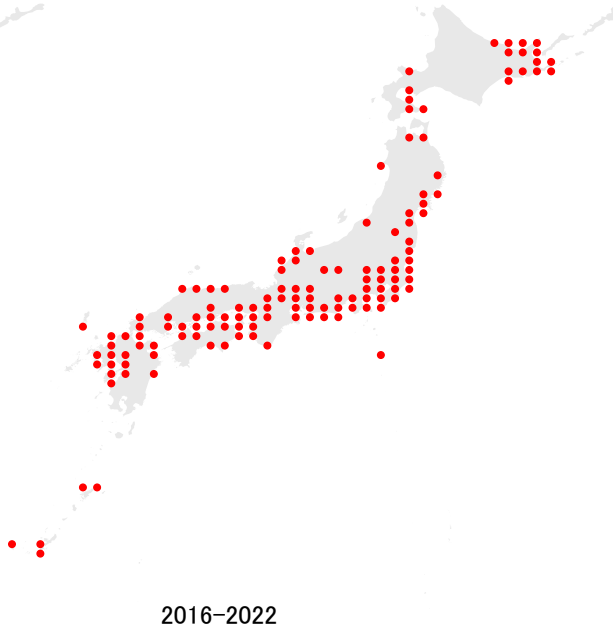


2016–2022

Black-headed Gull *Larus ridibundus* Length: 37.0-41.2cm Weight: 200-447g

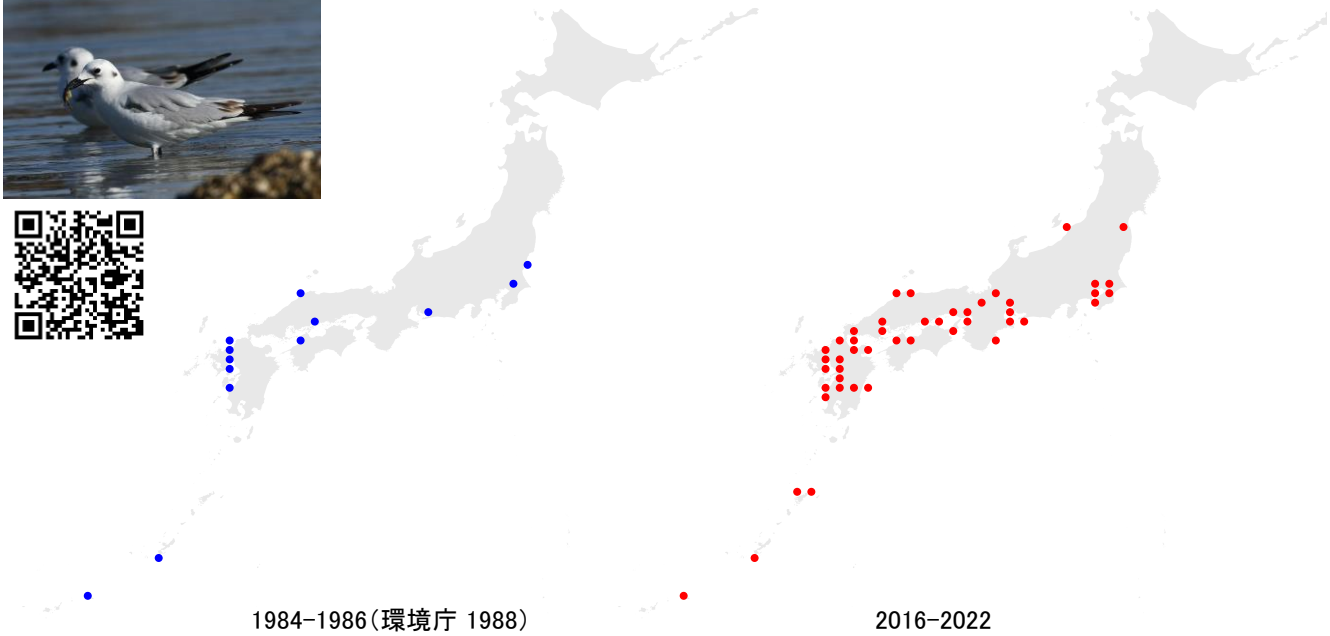


1984–1986（環境庁 1988）

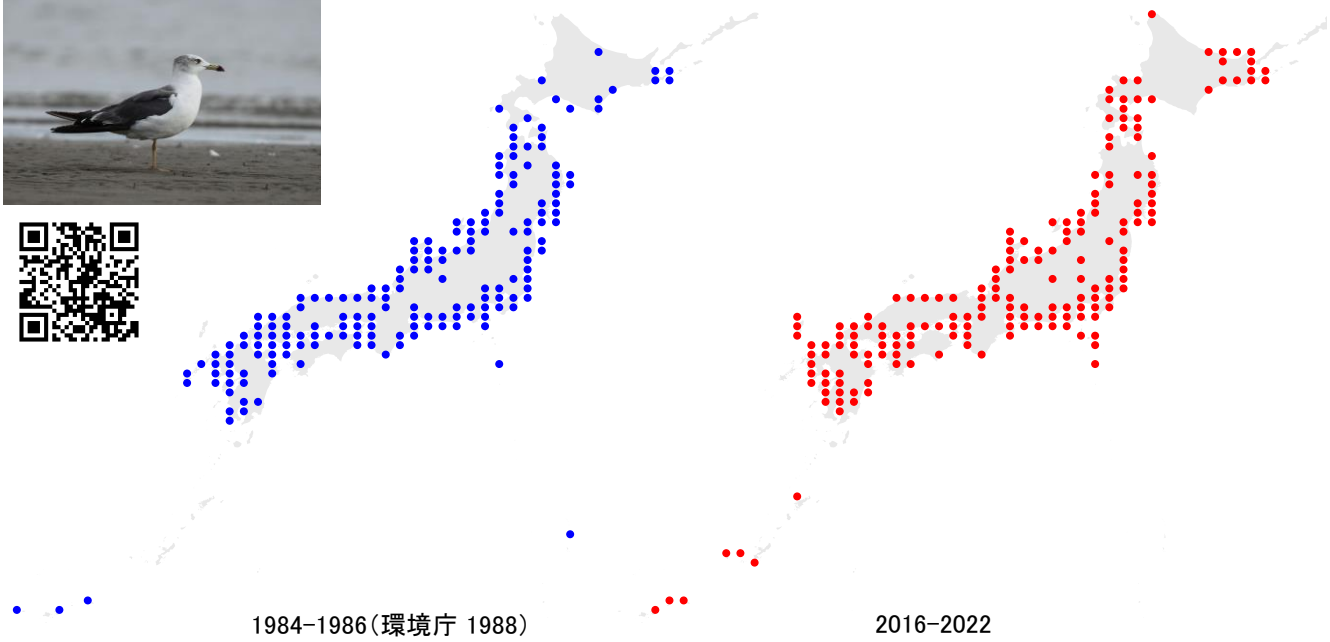


2016–2022

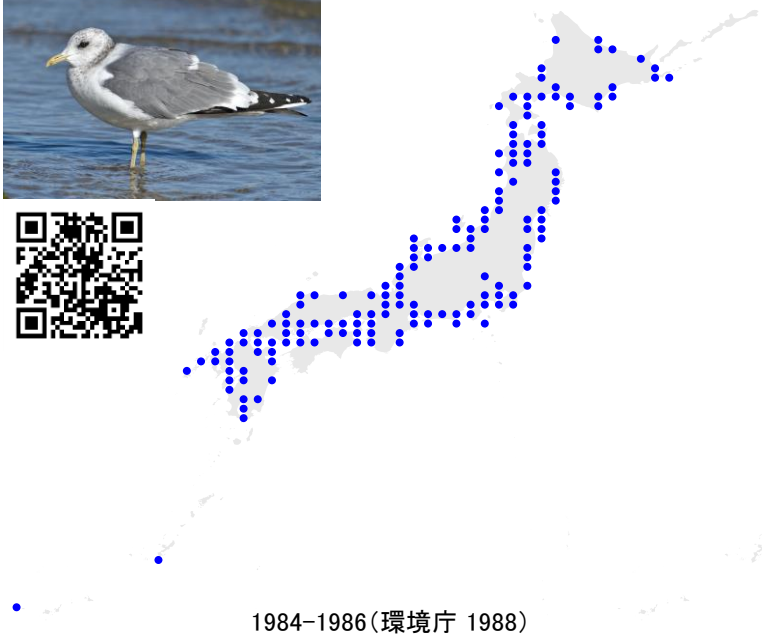
Saunders's Gull *Larus saundersi* Length: 31-32cm Weight: 200-215g



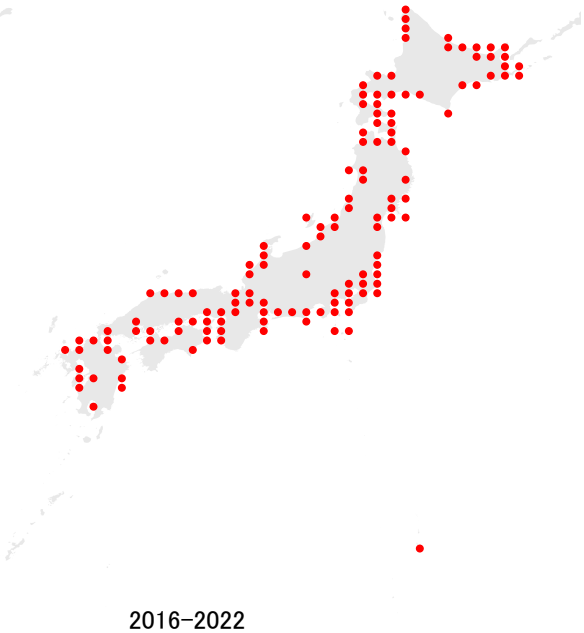
Black-tailed Gull *Larus crassirostris* Length: 44-47cm Weight: 475.1-619.9g



Mew Gull *Larus canus* Length: 42.1-46.3cm Weight: 440.3-593.3g

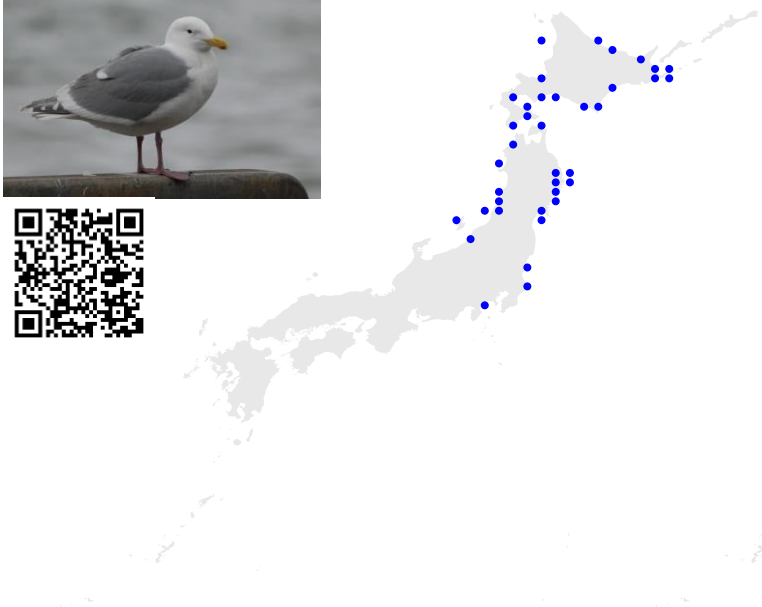


1984–1986（環境庁 1988）

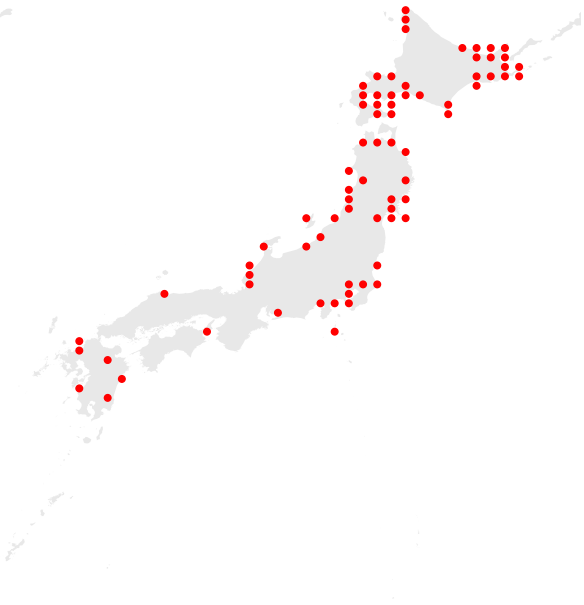


2016–2022

Glaucous-winged Gull *Larus glaucescens* Length: 61-68cm Weight: 900-1250g

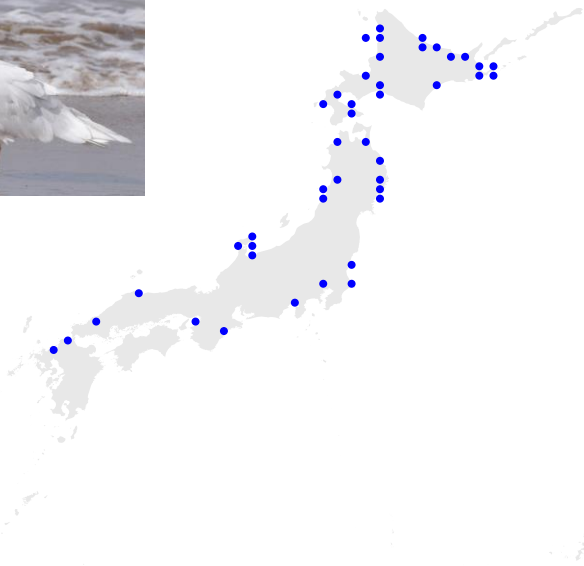


1984–1986（環境庁 1988）

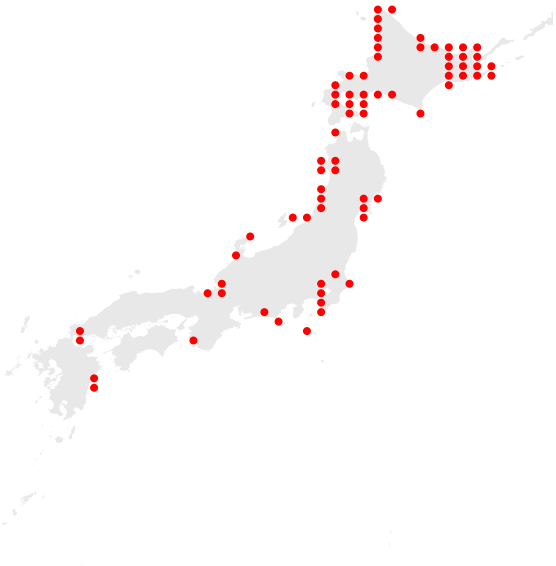


2016–2022

Glaucous Gull *Larus hyperboreus* Length: 68.5-74.6cm Weight: 1801.5-2267.3g

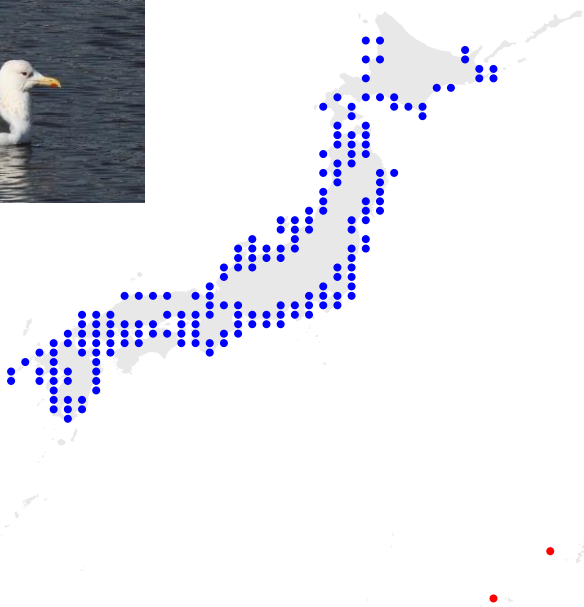


1984-1986（環境庁 1988）

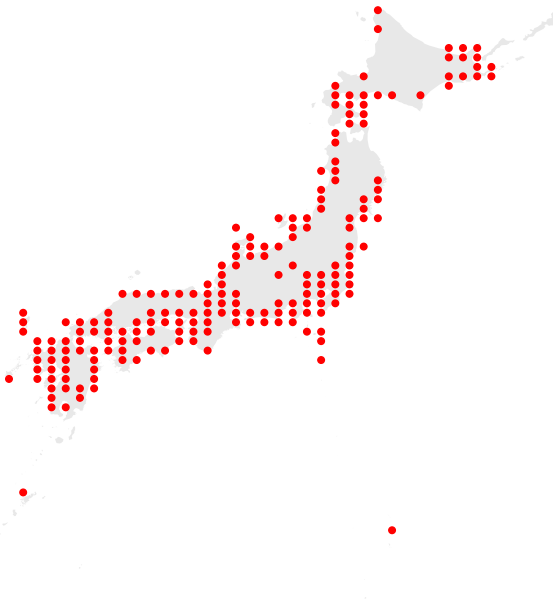


2016-2022

Vega Gull *Larus argentatus* Length: 56-66cm Weight: 865-1601g

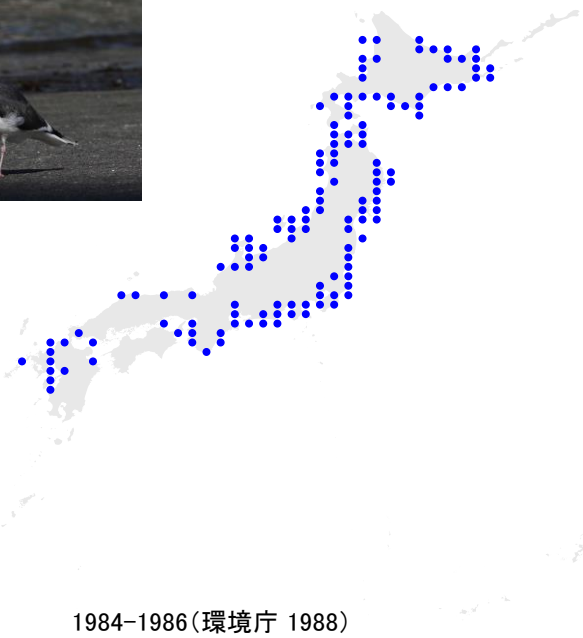


1984-1986（環境庁 1988）

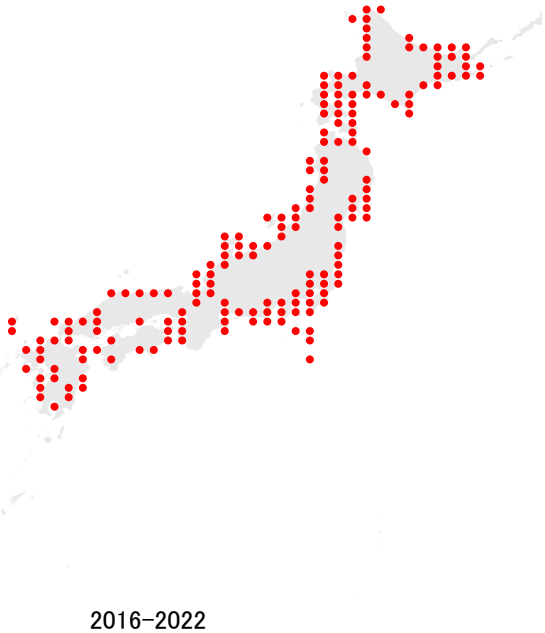


2016-2022

Slaty-backed Gull *Larus schistisagus* Length: 55-67cm Weight: 1167.4-1616.3g



1984–1986（環境庁 1988）



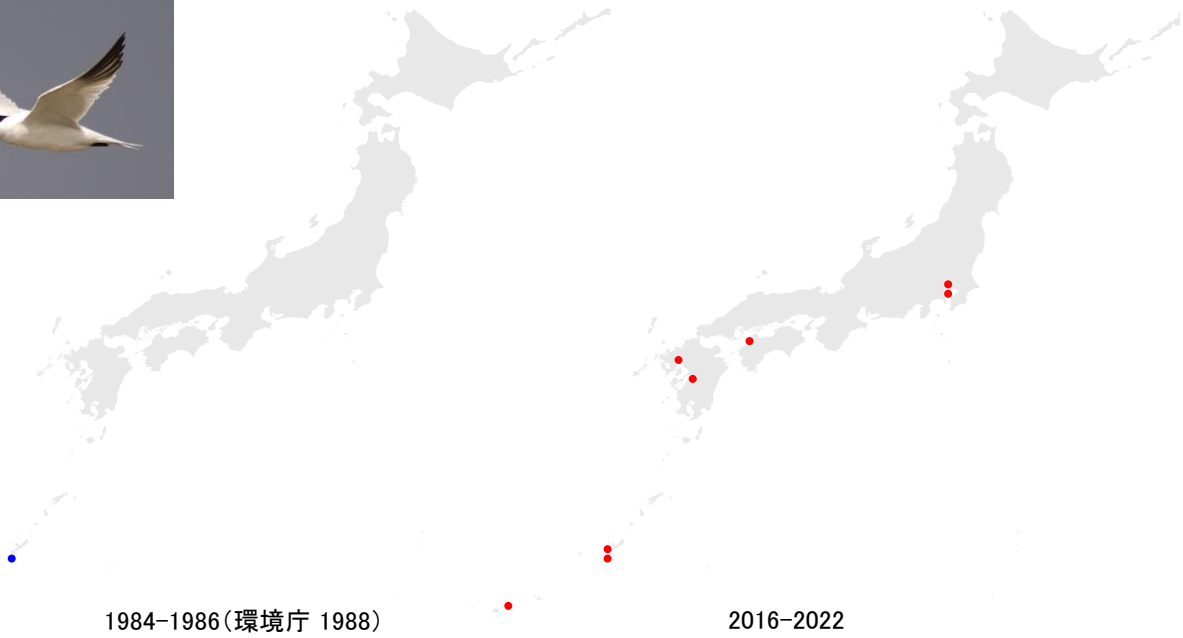
2016–2022

Lesser Black-backed Gull *Larus fuscus* Length: 52-64cm Weight: 620-1000g

1984–1986（環境庁 1988）

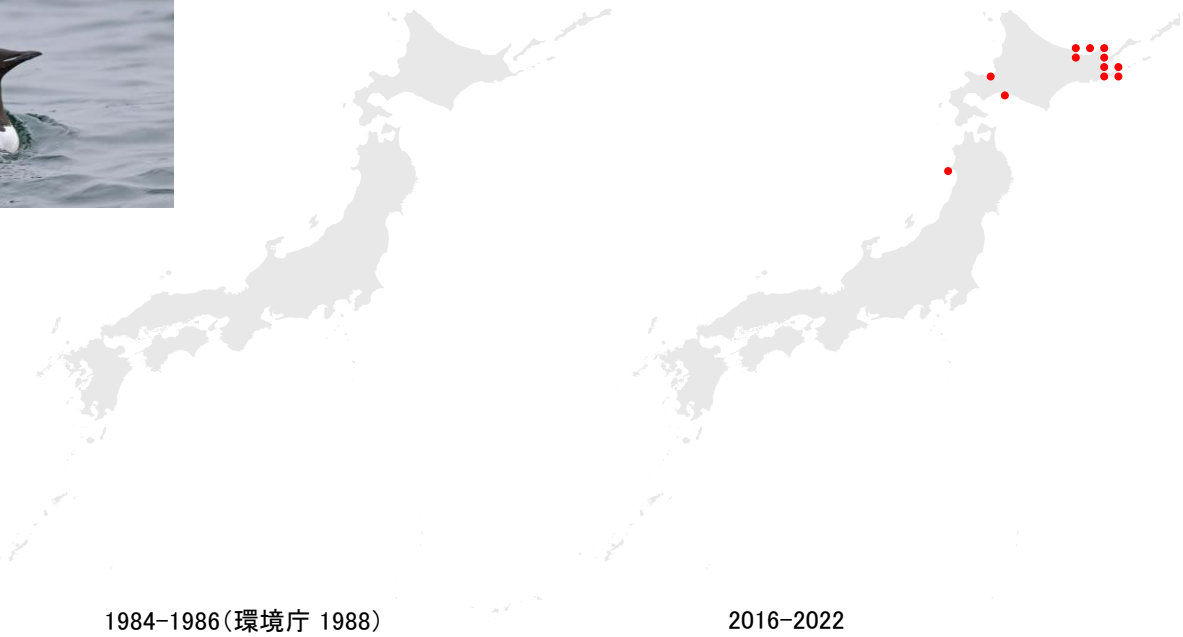
2016–2022

Caspian Tern *Sterna caspia* Length: 47-54cm Weight: 600-700g



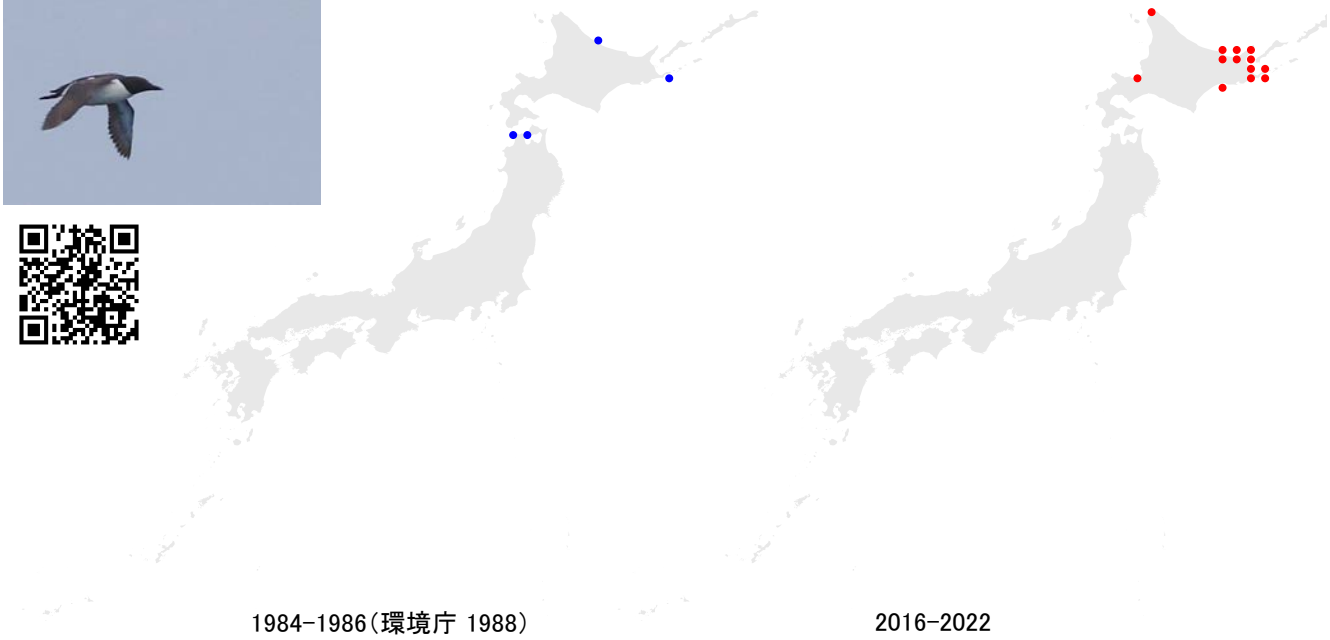
1984-1986（環境庁 1988） 2016-2022

Thick-billed Murre *Uria lomvia* Length: 39.2-44.0cm Weight: ♂1114±63.6g ♀1070±66.8g

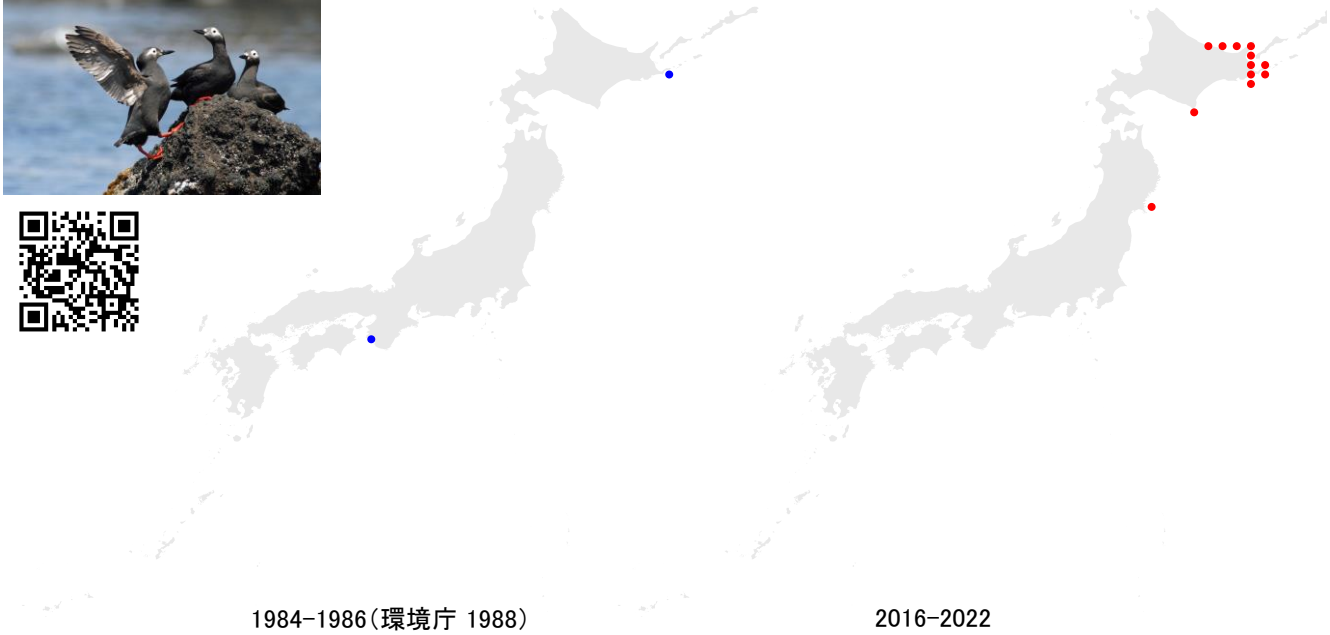


1984-1986（環境庁 1988） 2016-2022

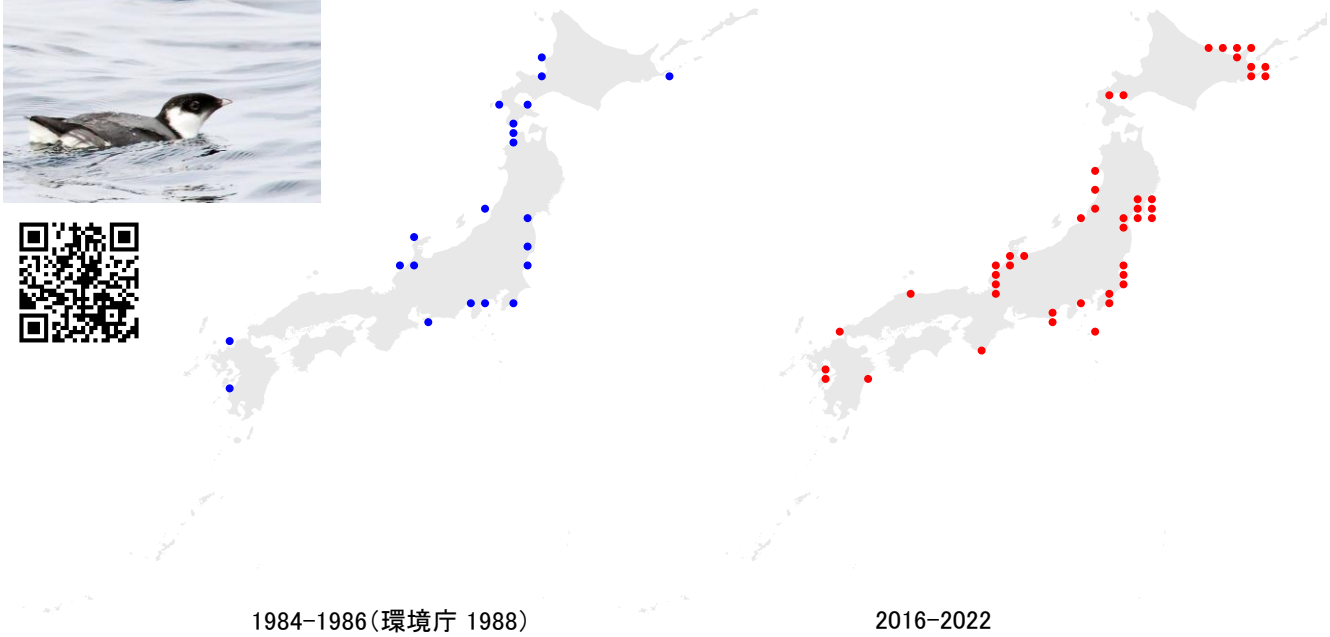
Common Murre *Uria aalge* Length: 42.0-47.2cm Weight: 595.5-926.6g



Spectacled Guillemot *Cepphus carbo* Length: 37cm Weight: 576-760g

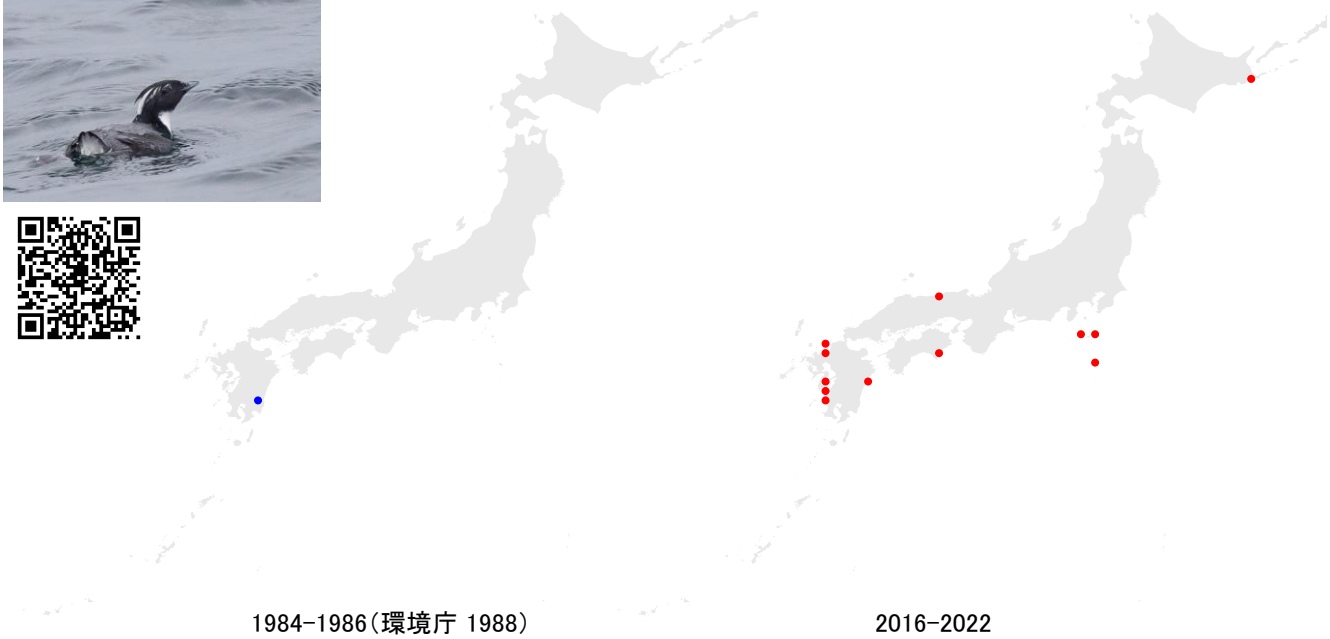


Ancient Murrelet *Synthliboramphus antiquus* Length: 24.1-26.7cm Weight: 191.3-295.1g



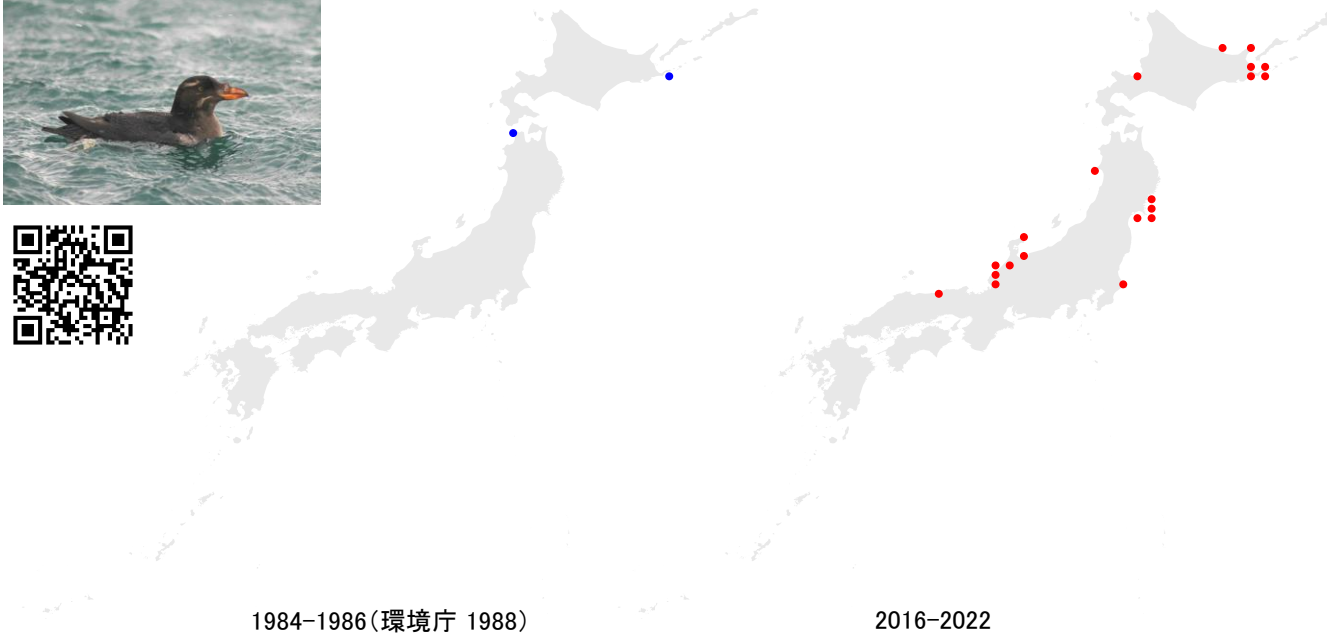
1984-1986（環境庁 1988） 2016-2022

Japanese Murrelet *Synthliboramphus wumizusume* Length: 22.0-26.5cm Weight: 139-213g

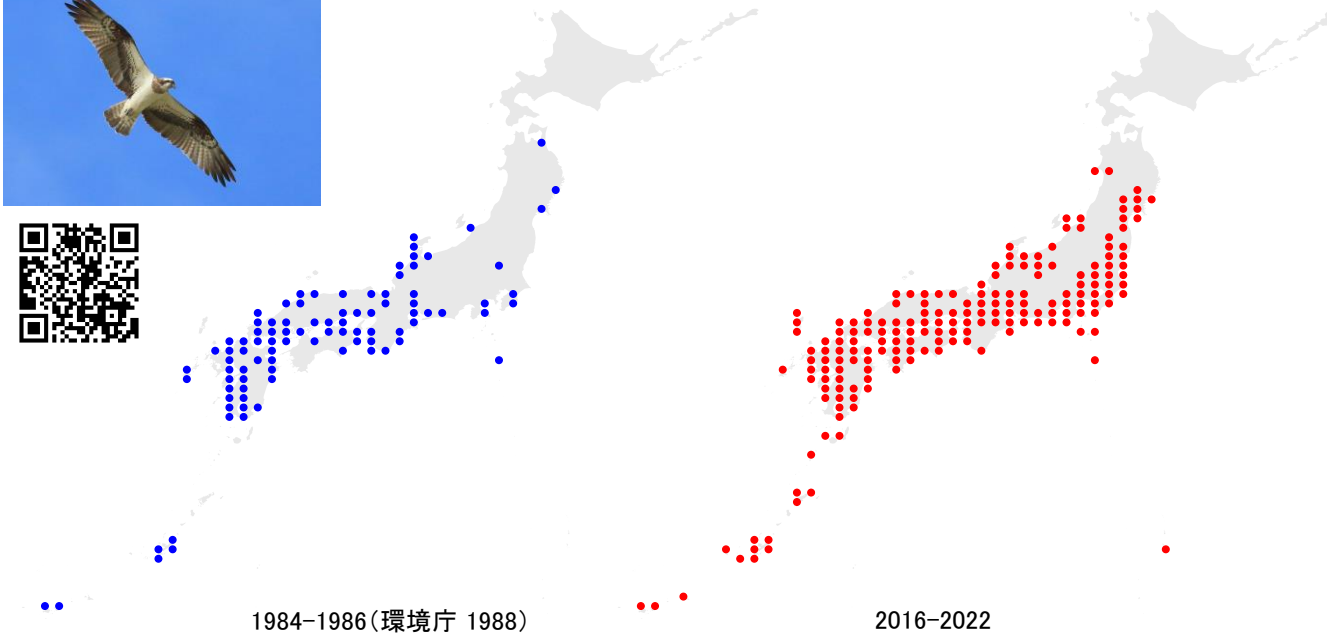


1984-1986（環境庁 1988） 2016-2022

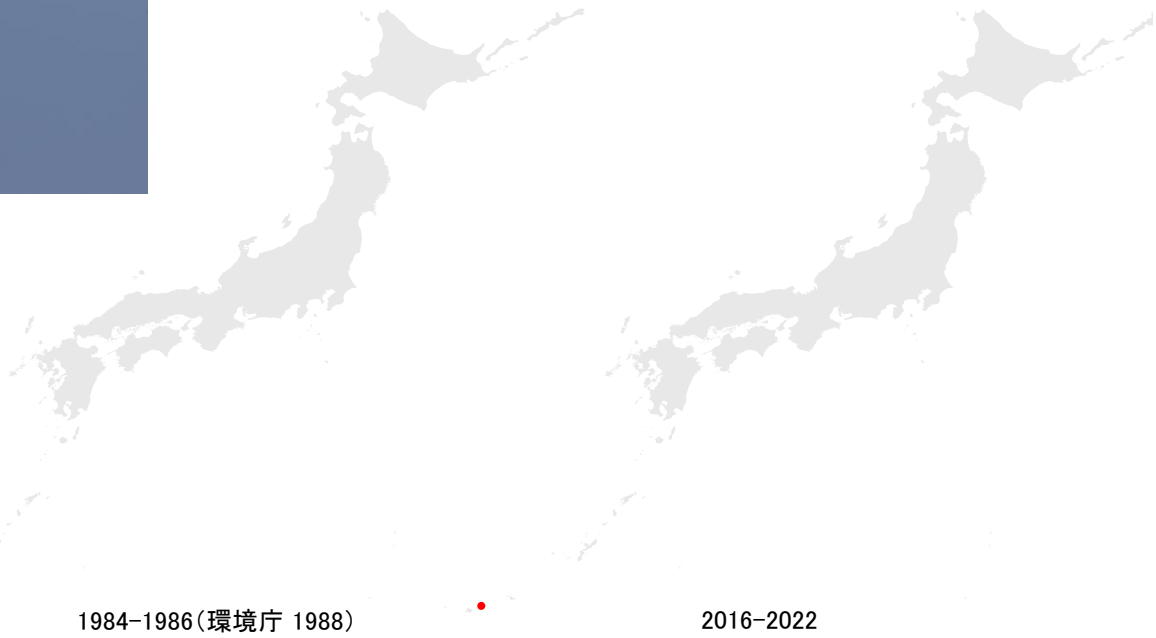
Rhinoceros Auklet *Cerorhinca monocerata* Length: 35-38cm Weight: 549±39g



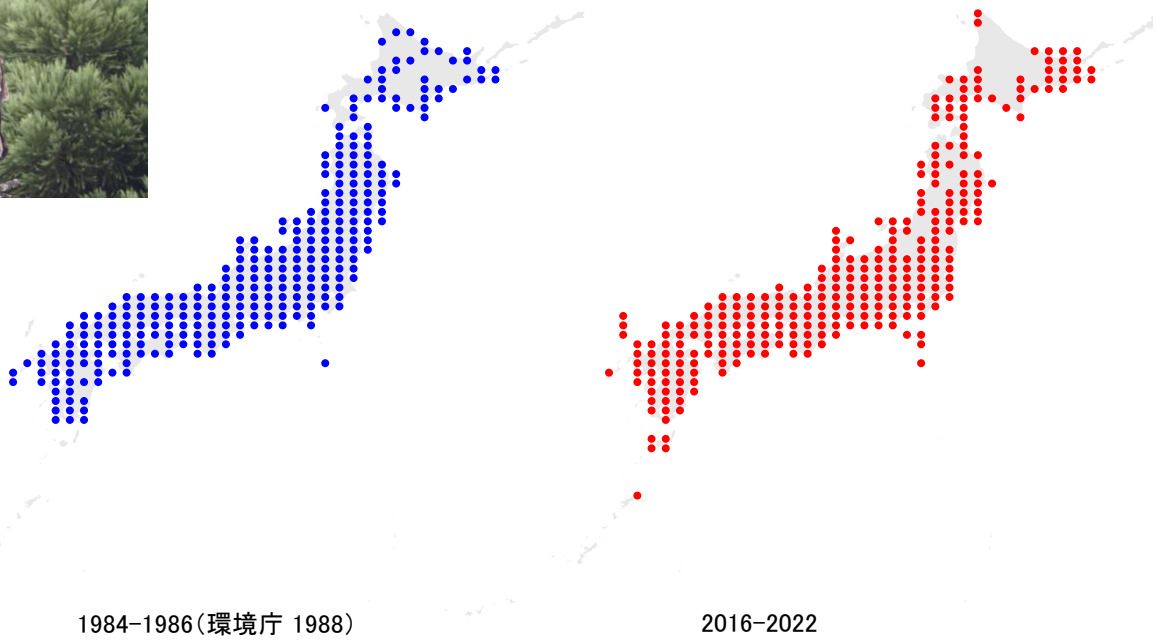
Western Osprey *Pandion haliaetus* Length: ♂56-60cm ♀58-62cm Weight: ♂2450-2718g ♀3160-4530g



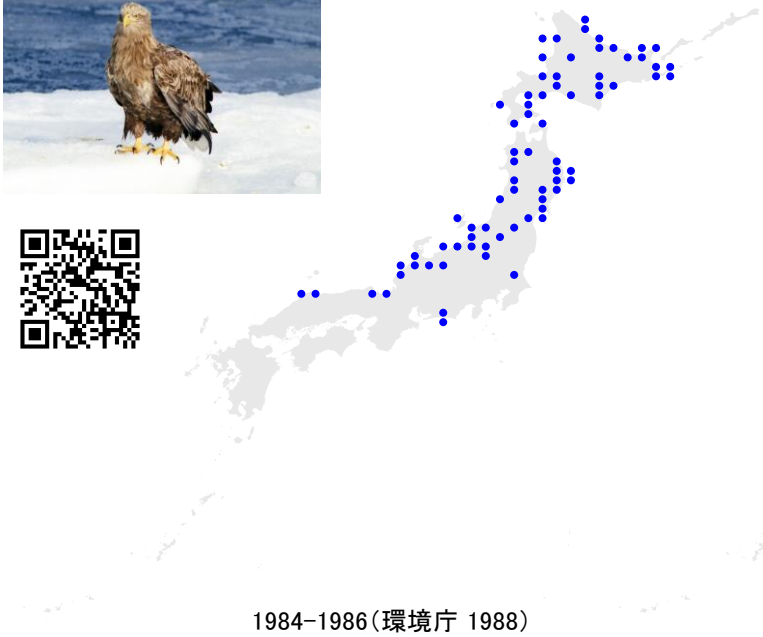
Black-winged Kite *Elanus caeruleus* Length: 84cm Weight: ♂197-277g ♀219-343g



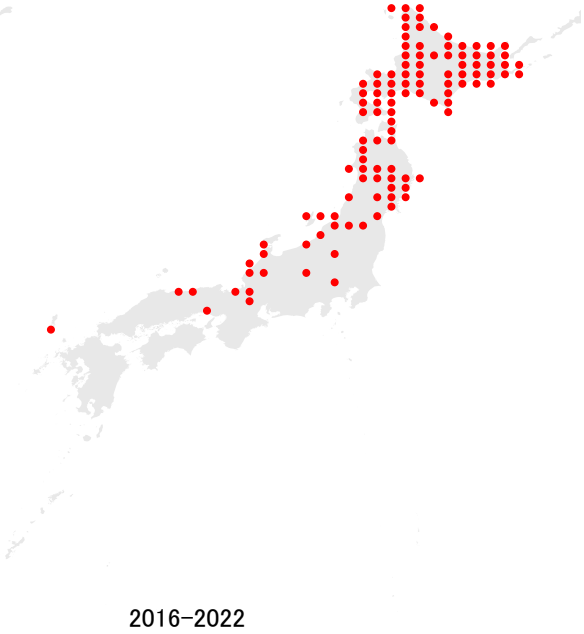
Black Kite *Milvus migrans* Length: ♂60.4±2.5cm ♀62.5±2.6cm Weight: ♂857±186g ♀1132±168g



White-tailed Eagle *Haliaeetus albicilla* Length: 70-90cm Weight: ♂3075-5430g ♀4080-6920g



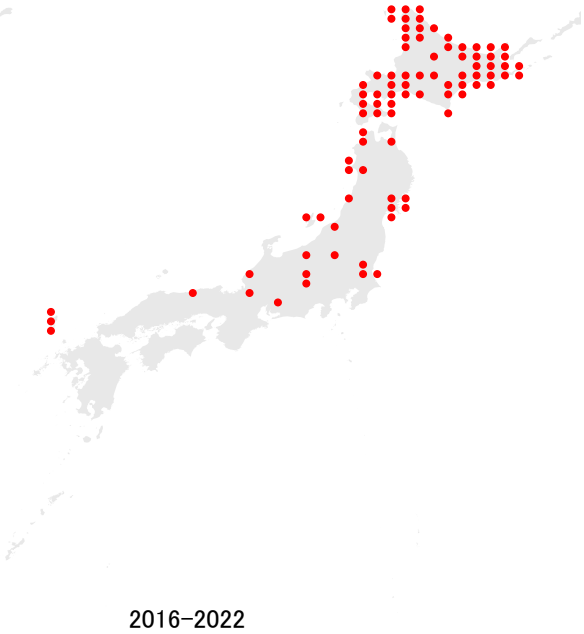
1984–1986（環境庁 1988）



2016–2022

Steller's Sea Eagle *Haliaeetus pelagicus* Length: 85-94cm Weight: 4900-9000g

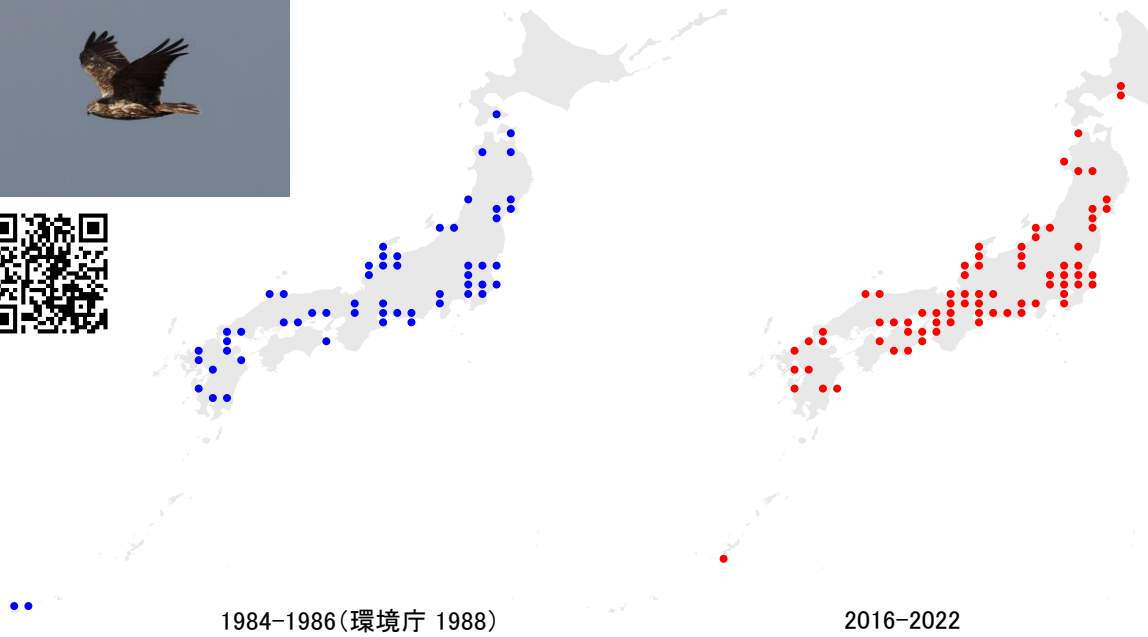
1984–1986（環境庁 1988）



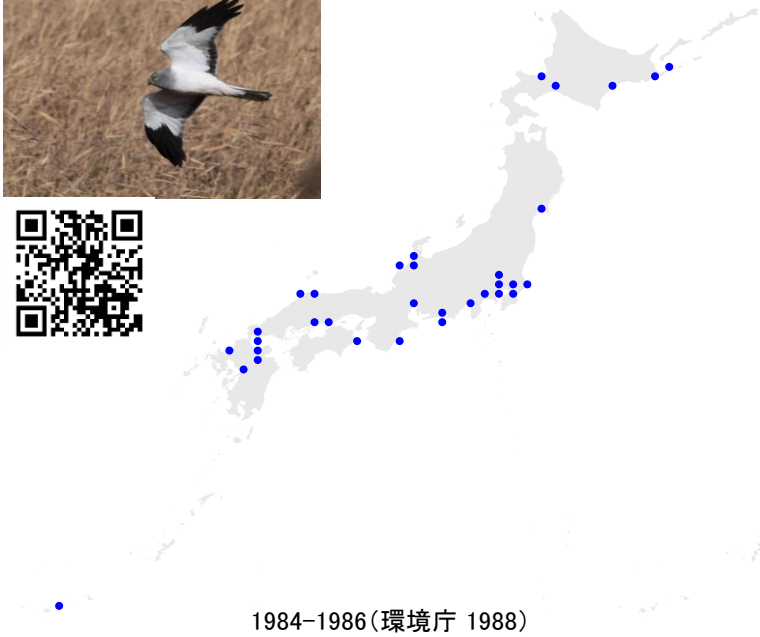
2016–2022

Crested Serpent Eagle *Spilornis cheela* Length: ♂50-53cm ♀51-54cm Weight: ♂670-780g ♀700-840g

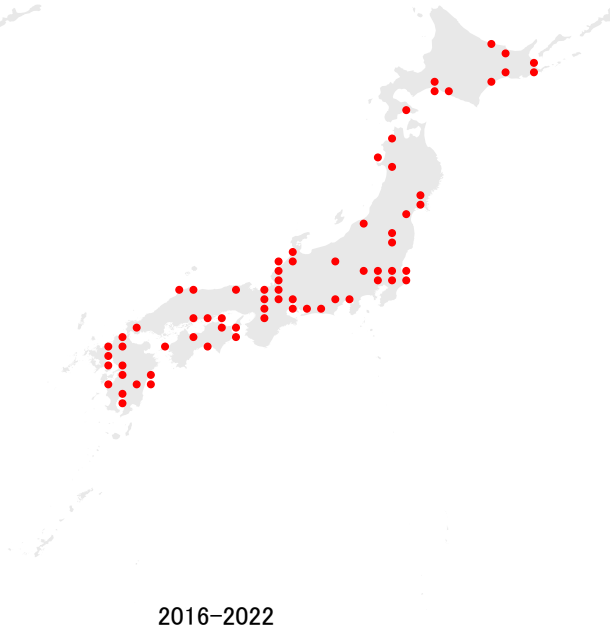
Eastern Marsh Harrier *Circus spilonotus* Length: ♂48.0cm ♀58.2cm Weight: 498-844g



Hen Harrier *Circus cyaneus* Length: 43-53cm Weight: 200-540g

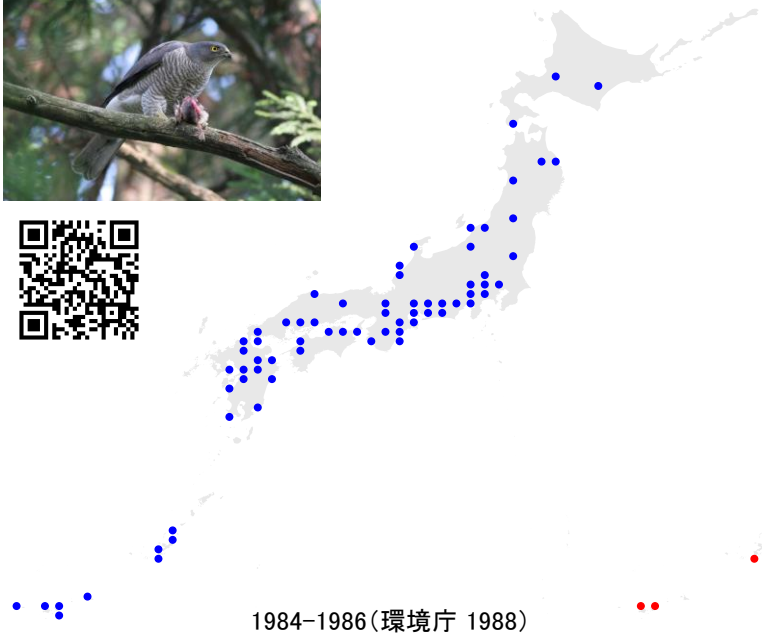


1984-1986（環境庁 1988）

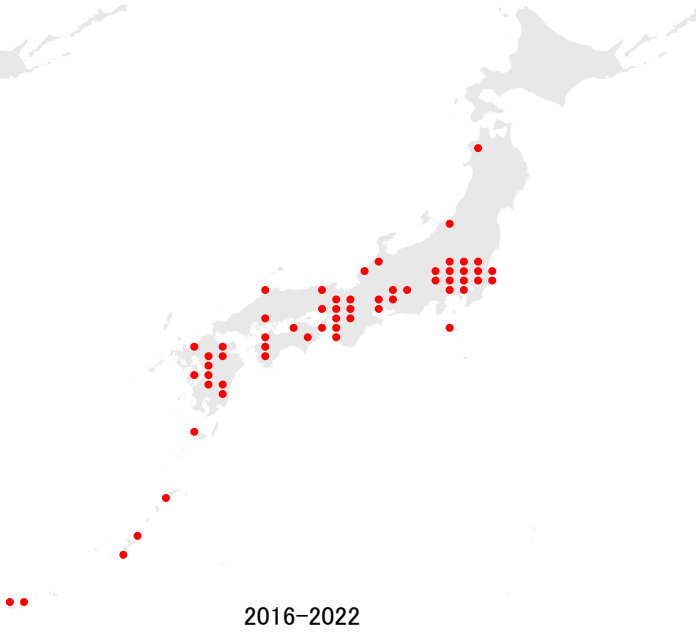


2016-2022

Japanese Sparrowhawk *Accipiter gularis* Length: ♂26.5cm ♀30.4cm Weight: ♂90g ♀135.8g

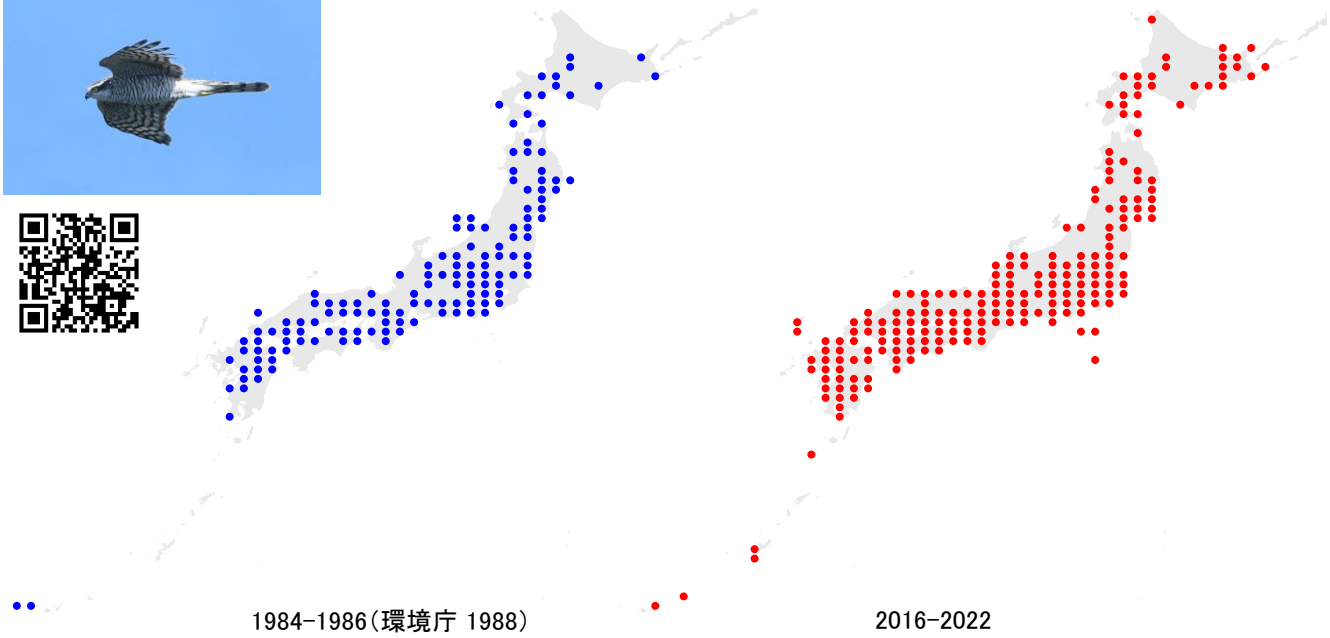


1984-1986（環境庁 1988）



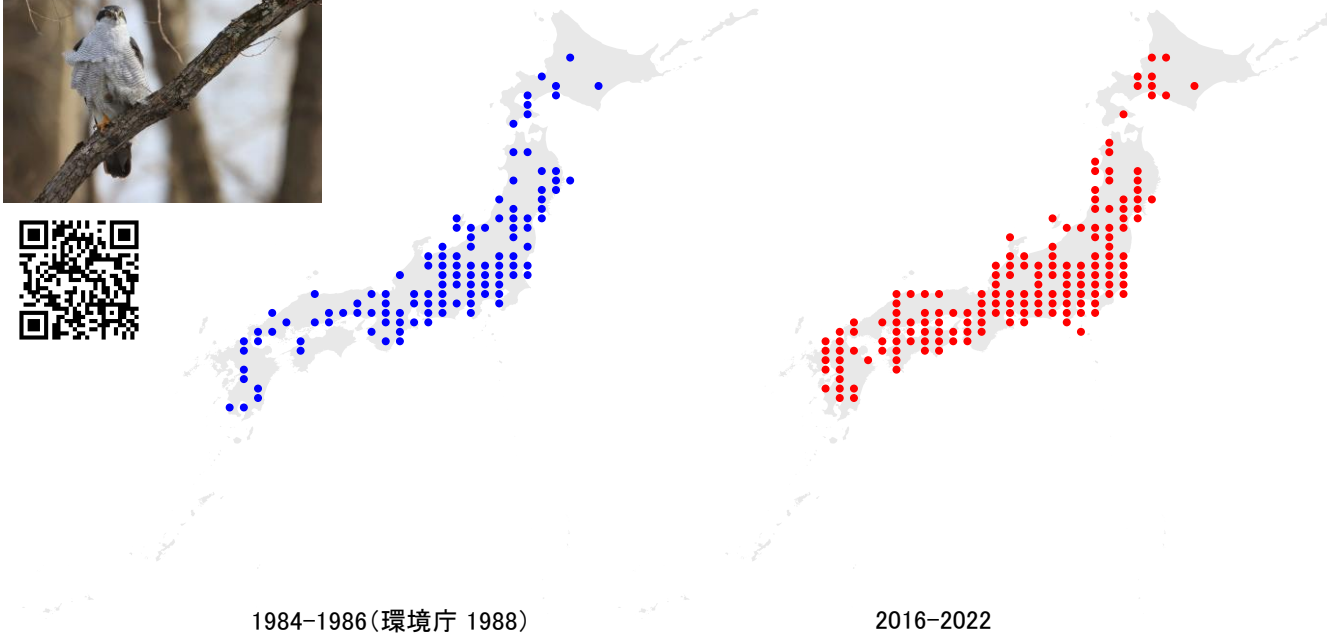
2016-2022

Eurasian Sparrowhawk *Accipiter nisus* Length: ♂30.2-32.7cm ♀37.2-40.2cm Weight: ♂107-138g ♀ 206-264g



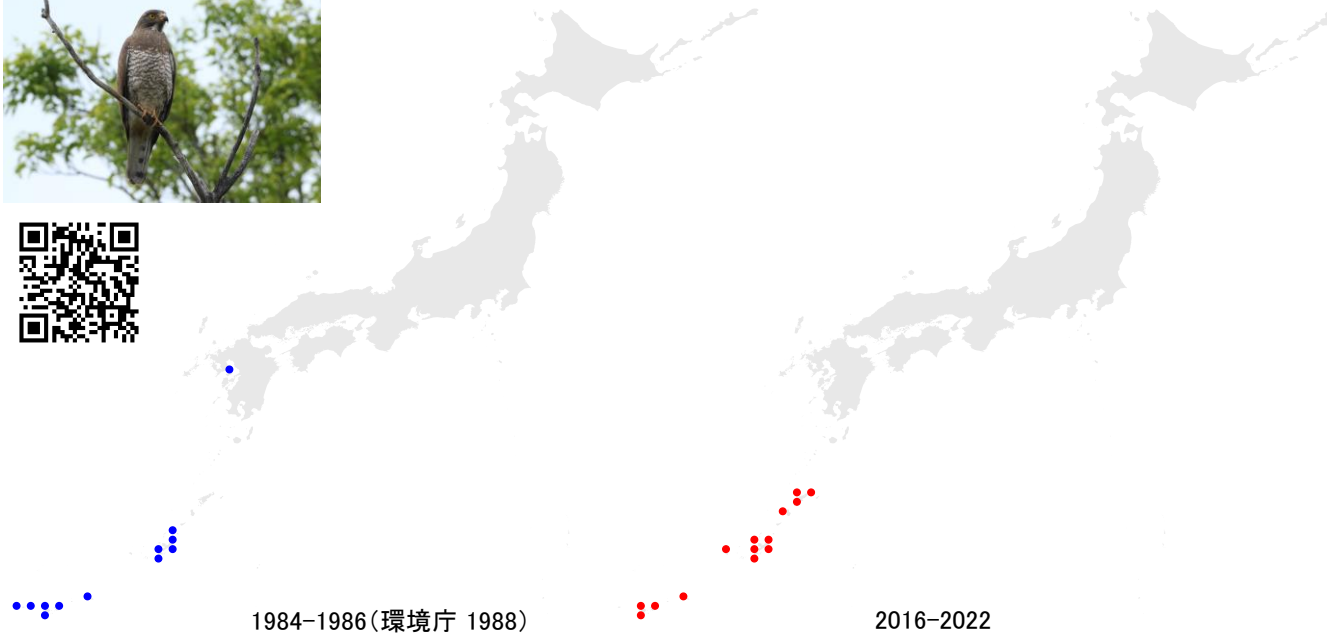
1984-1986（環境庁 1988） 2016-2022

Northern Goshawk *Accipiter gentilis* Length: ♂44.5-49.6cm ♀51.8-57.2cm Weight: ♂602-848g ♀929-1265g

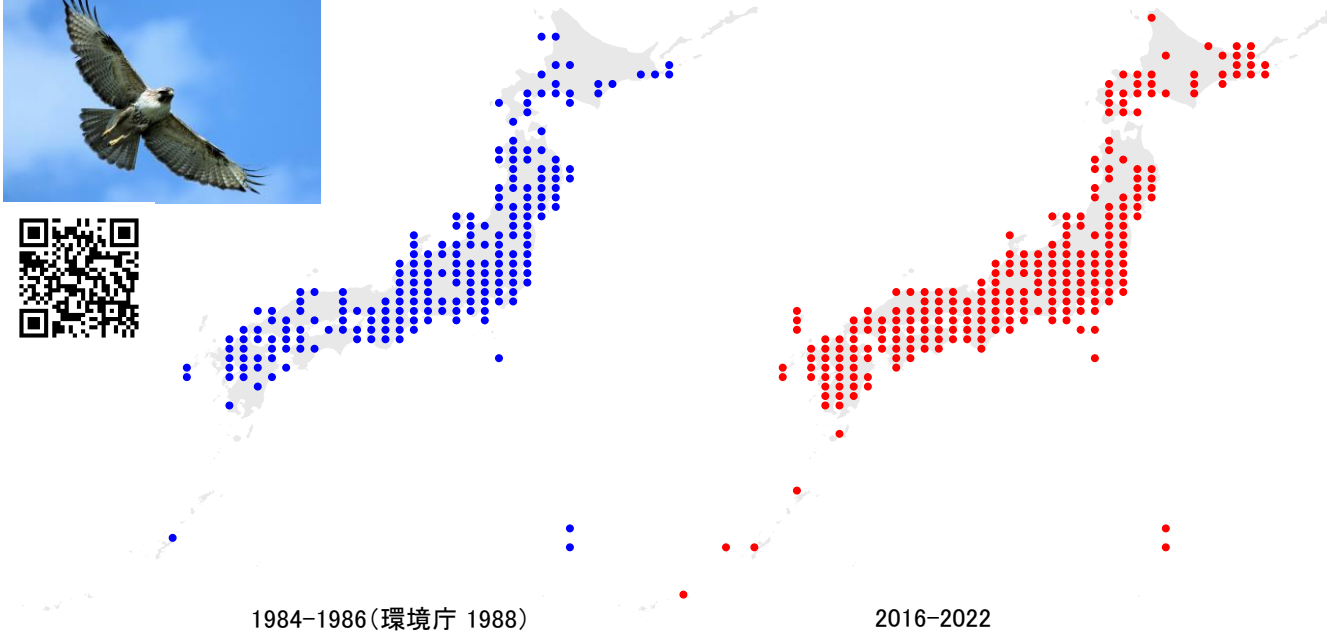


1984-1986（環境庁 1988） 2016-2022

Grey-faced Buzzard *Butastur indicus* Length：♂38.1-43.1cm ♀40.0-41.5cm Weight：♂390-500g ♀430-575g

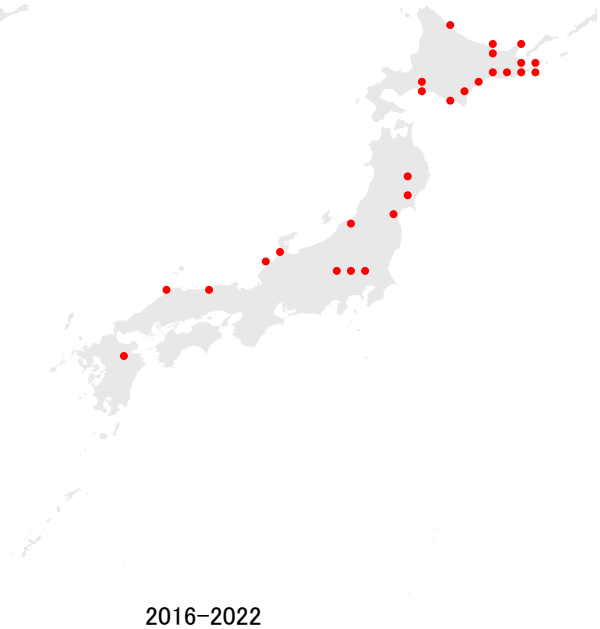


Eastern Buzzard *Buteo buteo* Length：♂50.3-53.0cm ♀53.5-59.5cm Weight：748-970g



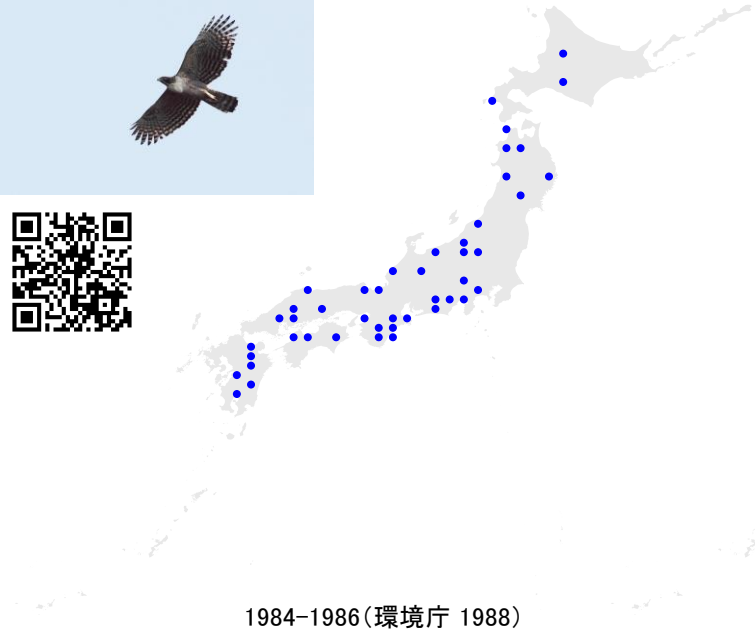
Rough-legged Buzzard *Buteo lagopus* Length: ♂53-57cm ♀58-61cm Weight: ♂730-990g ♀845-1152g

1984-1986（環境庁 1988）

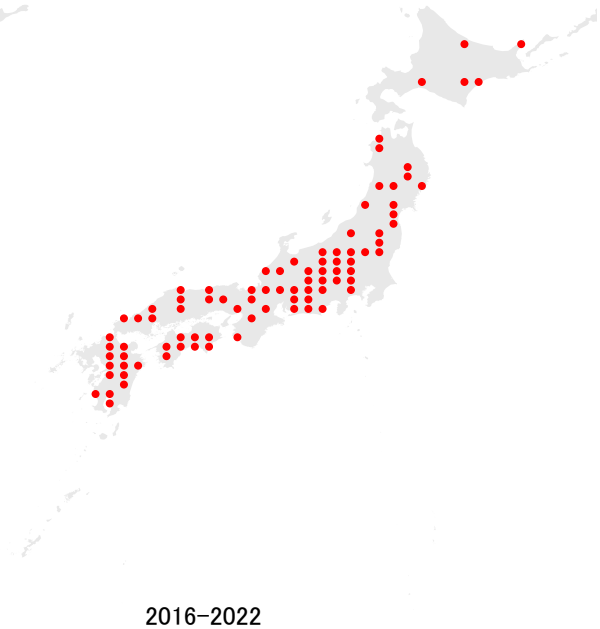


2016-2022

Mountain Hawk-Eagle *Nisaetus nipalensis* Length: ♂70-73cm ♀73-81cm Weight: ♂2300-2700 ♀2500-3900g

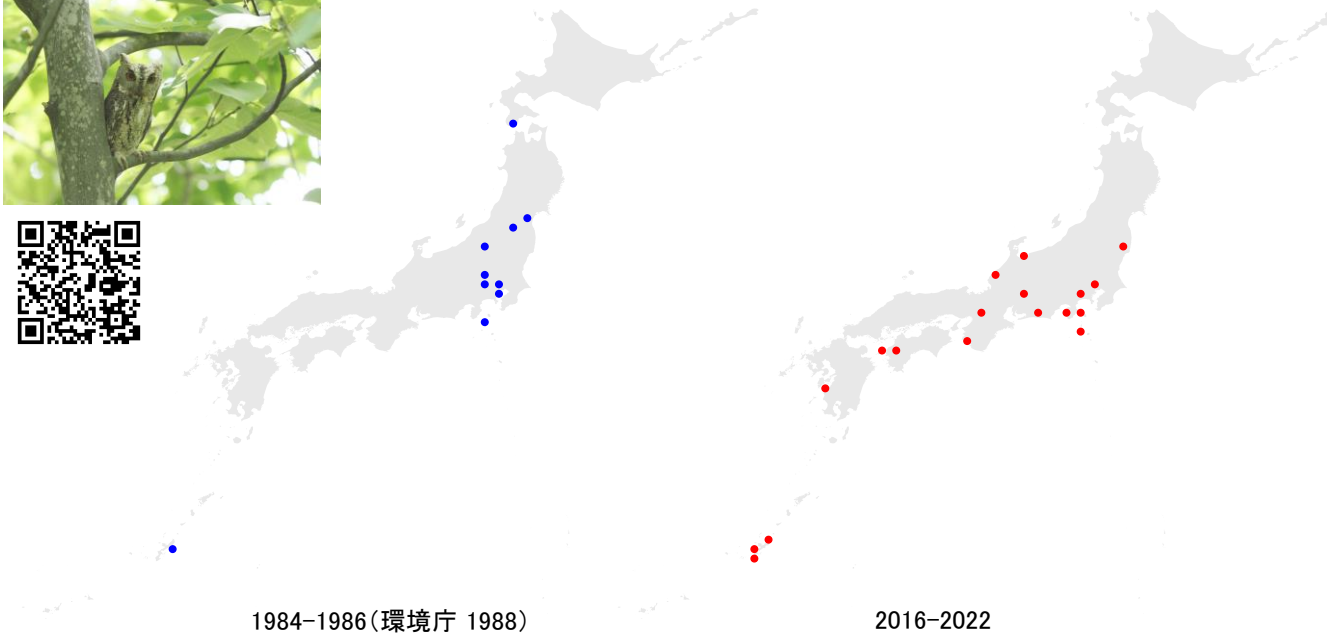


1984-1986（環境庁 1988）

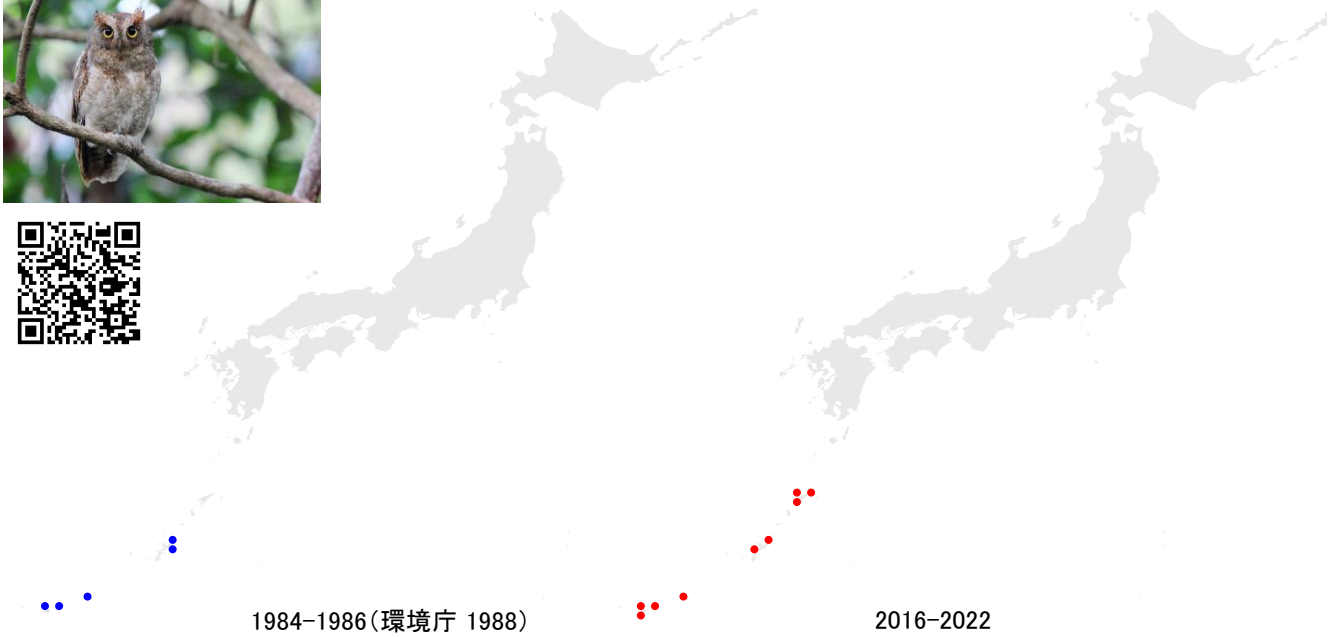


2016-2022

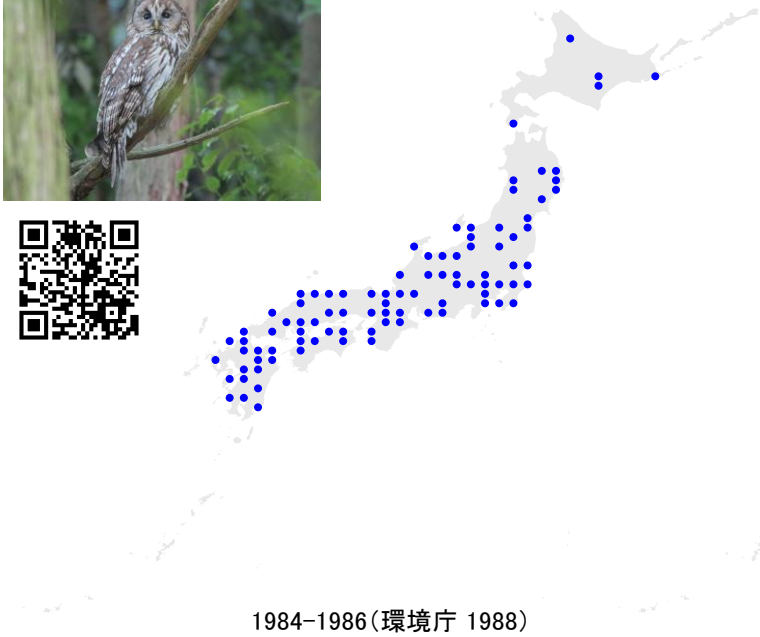
Japanese Scops Owl *Otus lempiji* Length: 23-25cm Weight: 120-200g



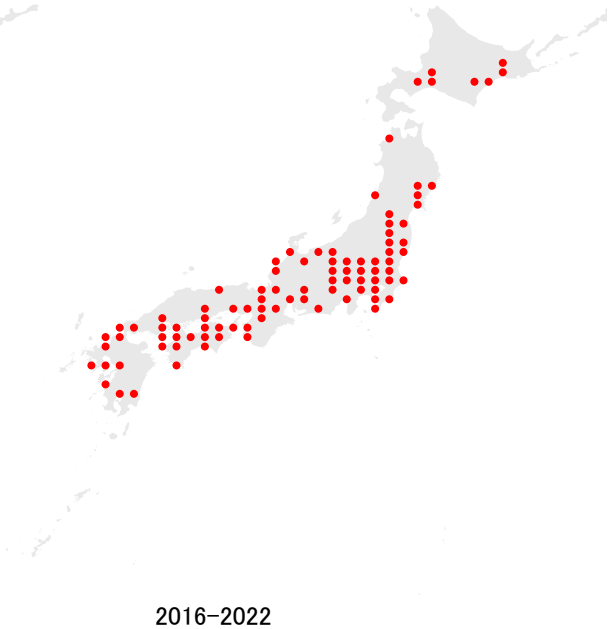
Ryukyu Scops Owl *Otus elegans* Length: 18-20cm Weight: ♂70.0-102.0g ♀78.0-111.5g



Ural Owl *Strix uralensis* Length: 50cm Weight: 600-800g

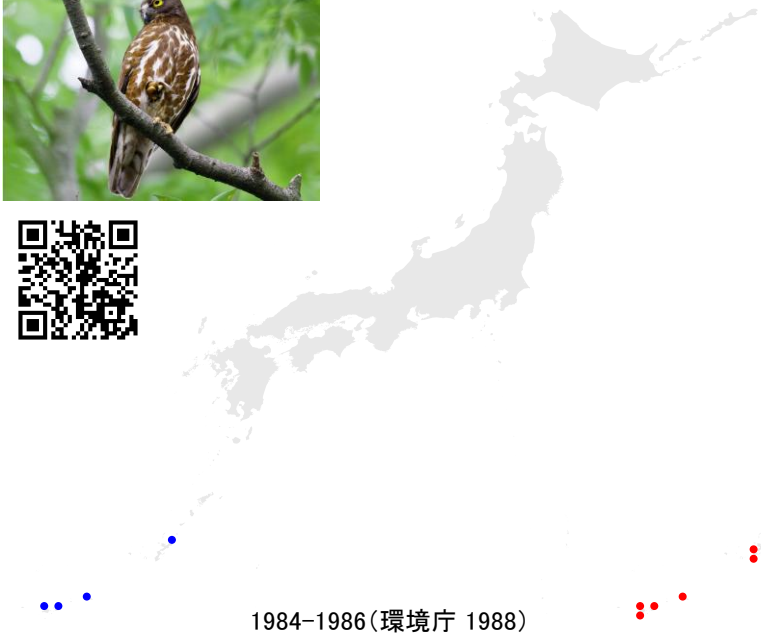


1984-1986(環境庁 1988)

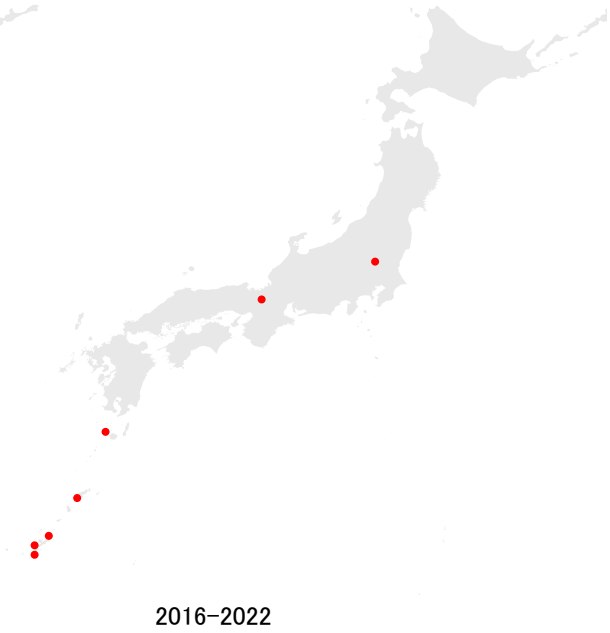


2016-2022

Northern Boobook *Ninox scutulata* Length: 29cm Weight: 185-227g

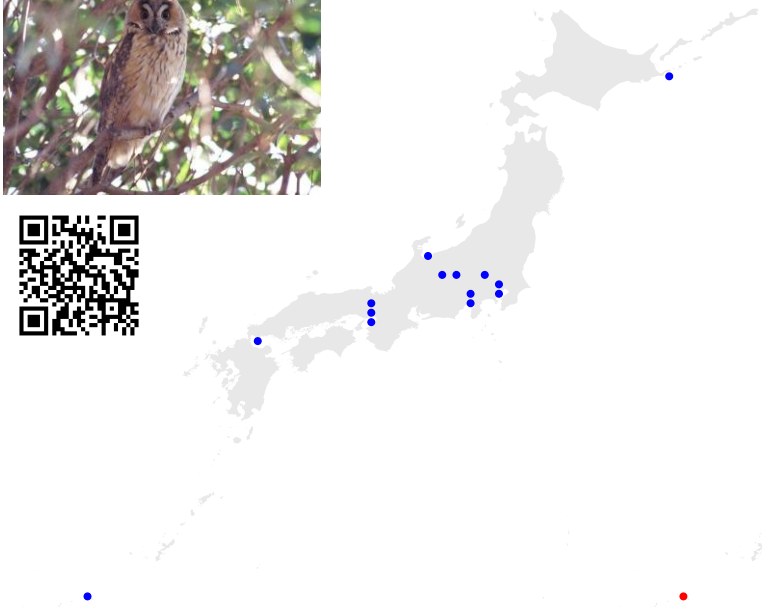


1984-1986(環境庁 1988)

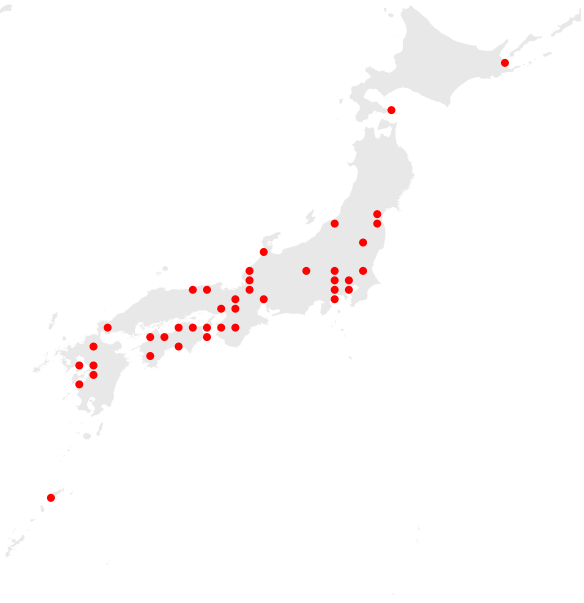


2016-2022

Long-eared Owl *Asio otus* Length: 37cm Weight: 300g



1984-1986(環境庁 1988)



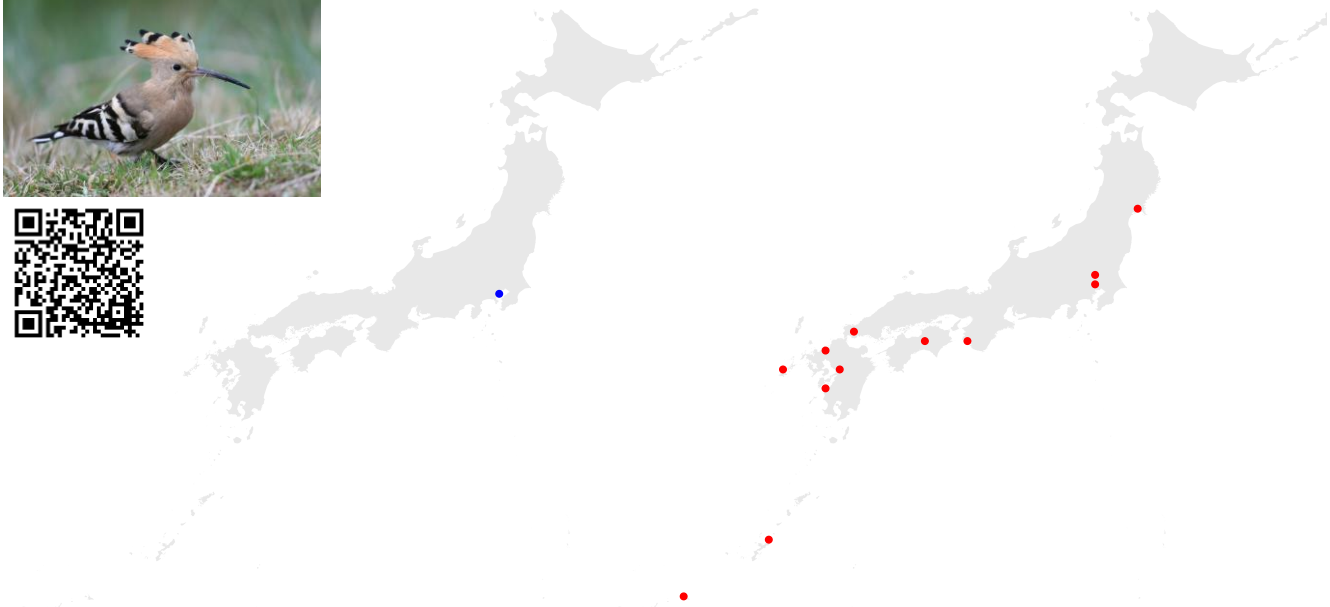
2016-2022

Short-eared Owl *Asio flammeus* Length: 38cm Weight: 350g

1984-1986(環境庁 1988)

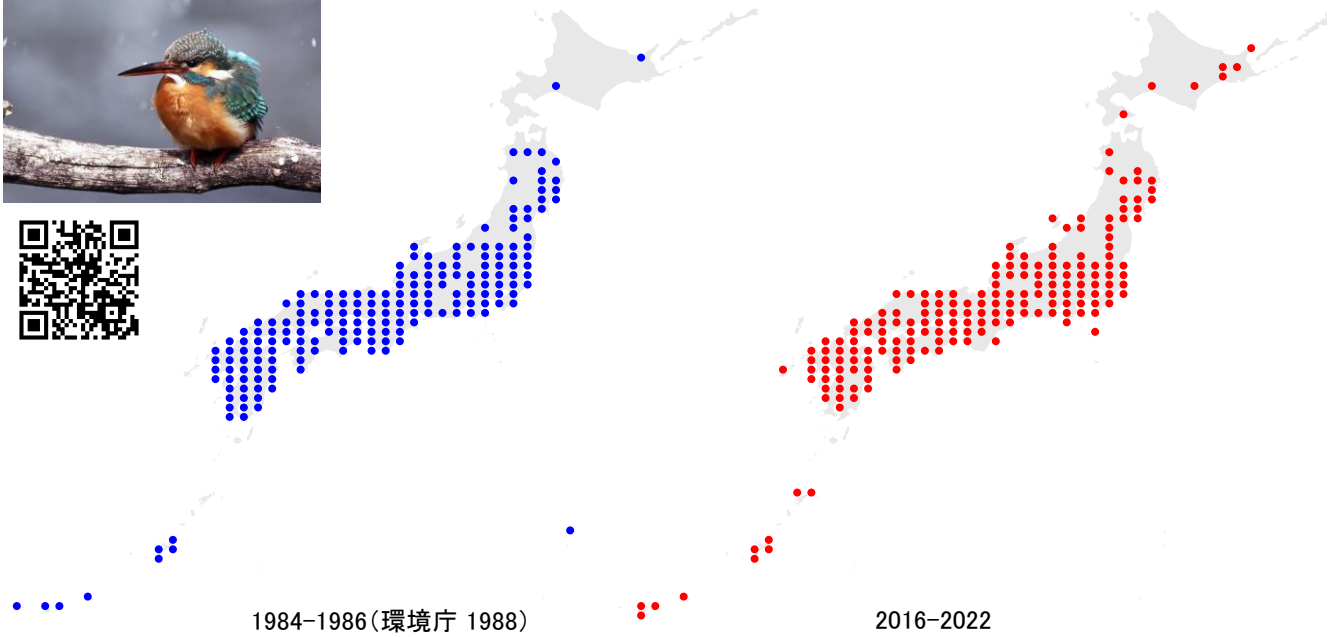
2016-2022

Eurasian Hoopoe *Upupa epops* Length: 25-30cm Weight: 70g



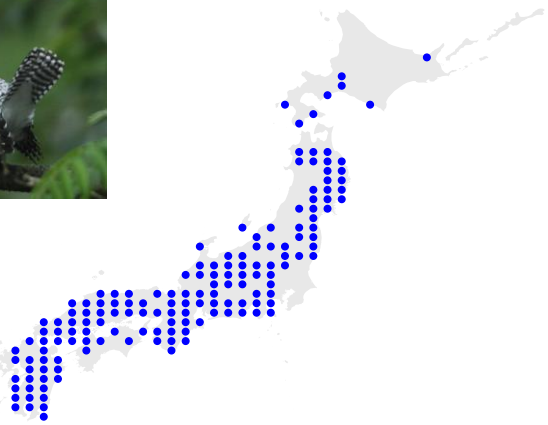
1984-1986(環境庁 1988) 2016-2022

Common Kingfisher *Alcedo atthis* Length: 17cm Weight: 30g

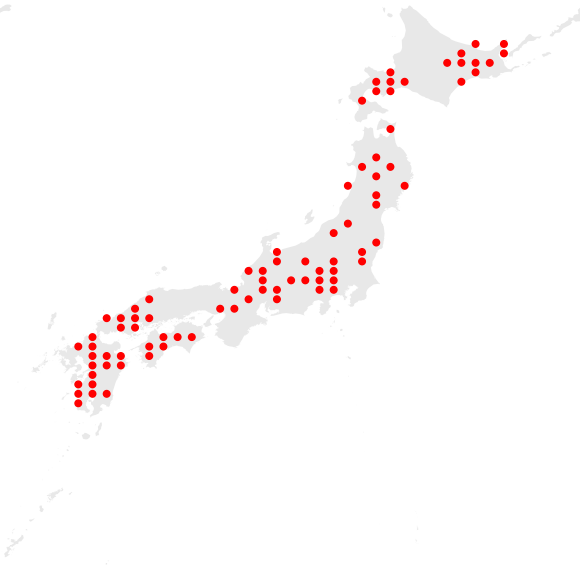


1984-1986(環境庁 1988) 2016-2022

Crested Kingfisher *Megaceryle lugubris* Length: 41-43cm Weight: 240-305g



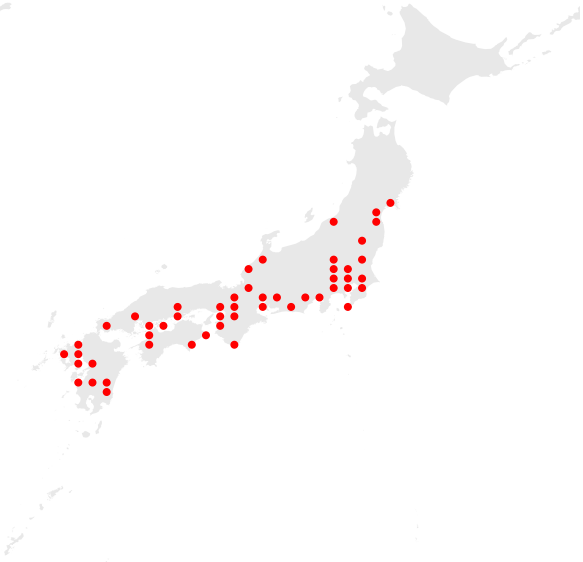
1984–1986（環境庁 1988）



2016–2022

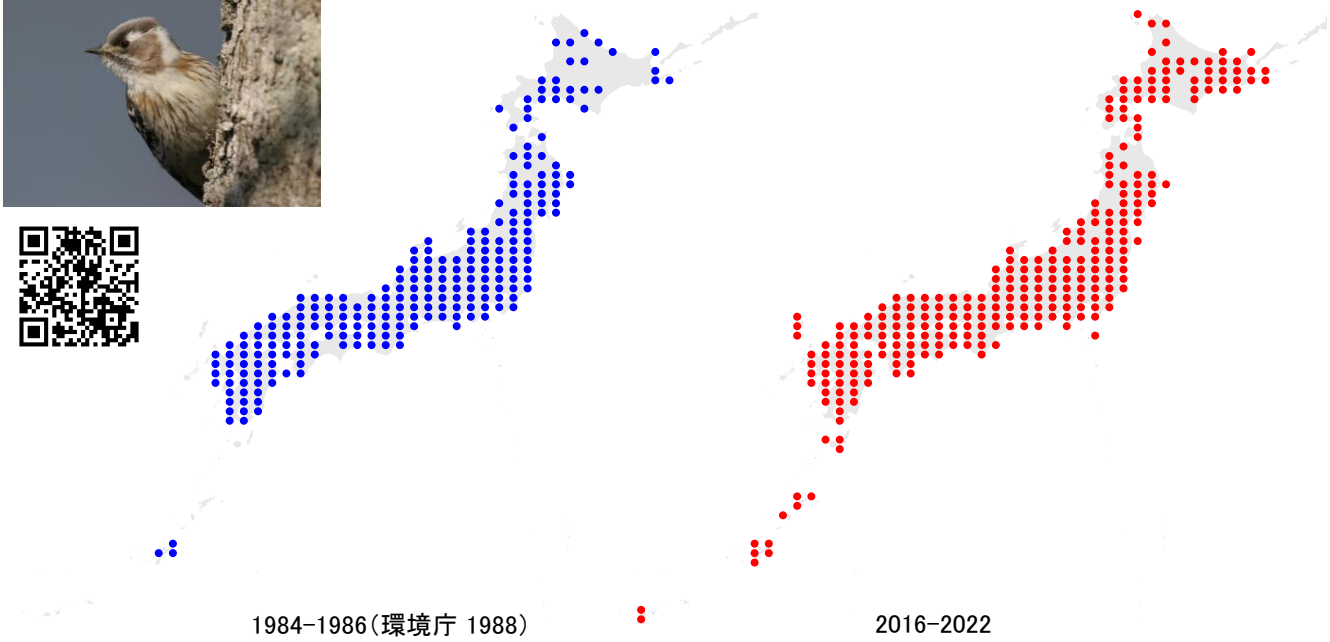
Eurasian Wryneck *Jynx torquilla* Length: 16.4-18.3cm Weight: ♂32.6-46.0g ♀37.7-42.4g

1984–1986（環境庁 1988）

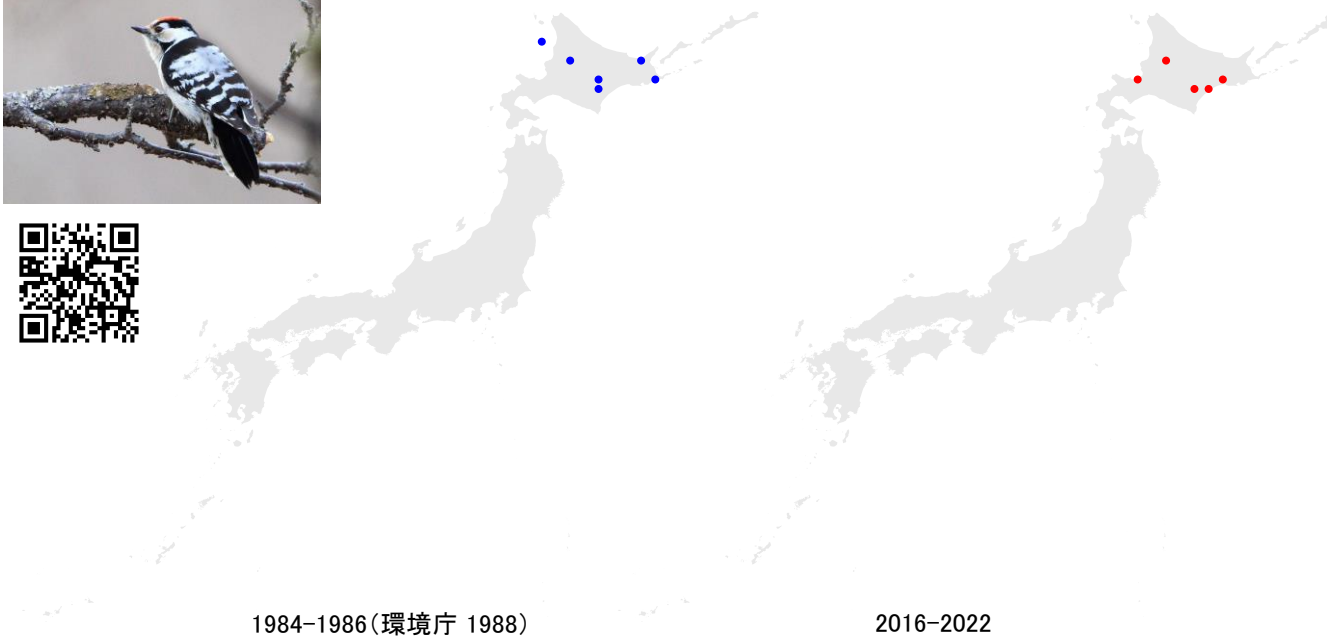


2016–2022

Japanese Pygmy Woodpecker *Dendrocopos kizuki* Length: 15cm Weight: ♂17.8-22.8g ♀19.3-26.4g

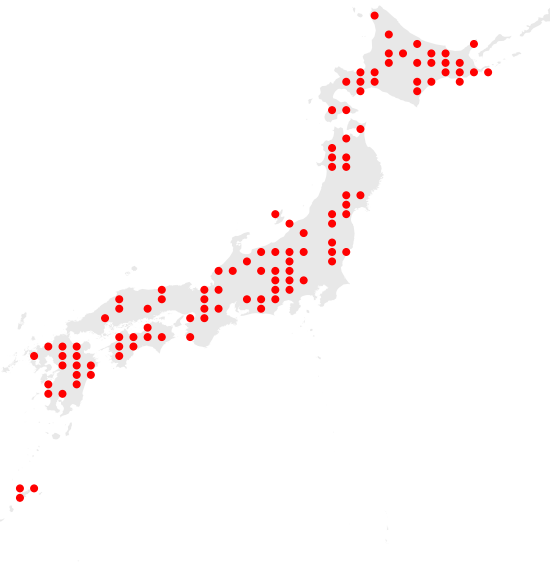


Lesser Spotted Woodpecker *Dendrocopos minor* Length: 16cm Weight: 17-26g



White-backed Woodpecker *Dendrocopos leucotos* Length: 28cm Weight: 92-158g

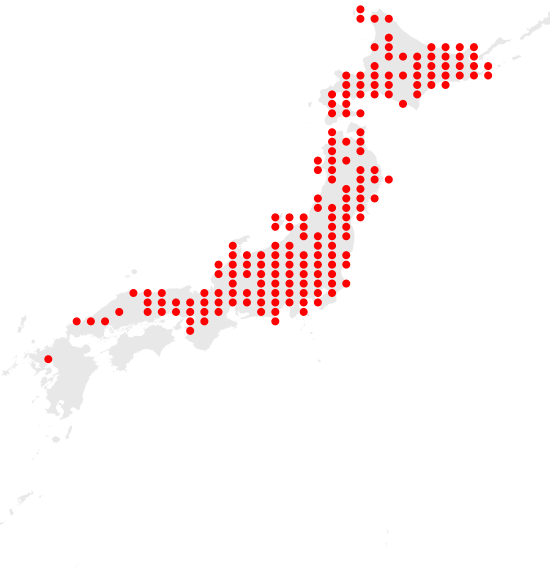
1984-1986（環境庁 1988）



2016-2022

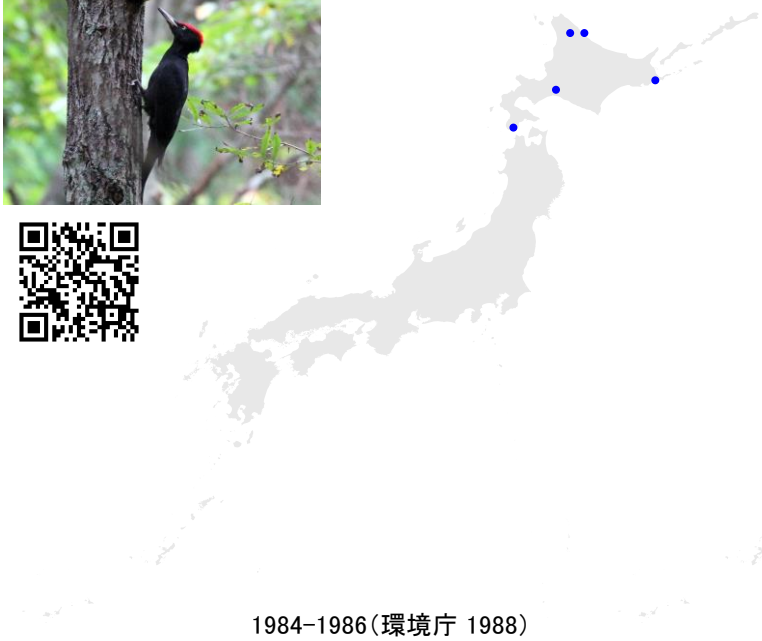
Great Spotted Woodpecker *Dendrocopos major* Length: 24cm Weight: 61.0-86.0g

1984-1986（環境庁 1988）

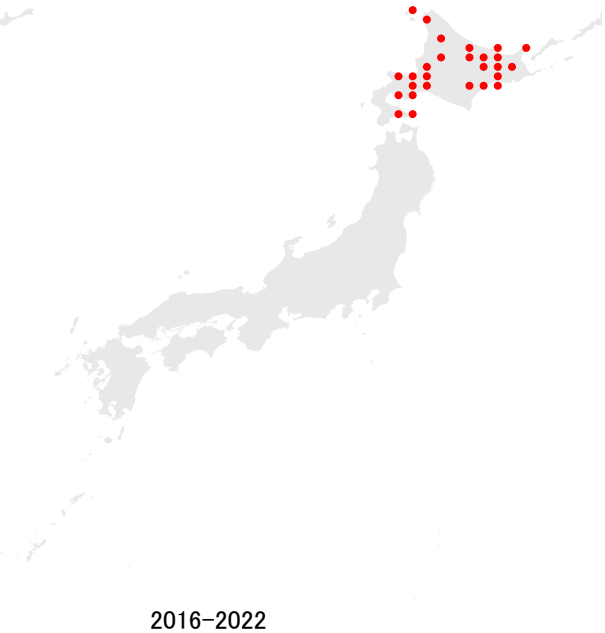


2016-2022

Black Woodpecker *Dryocopus martius* Length: 45cm Weight: 250-370g

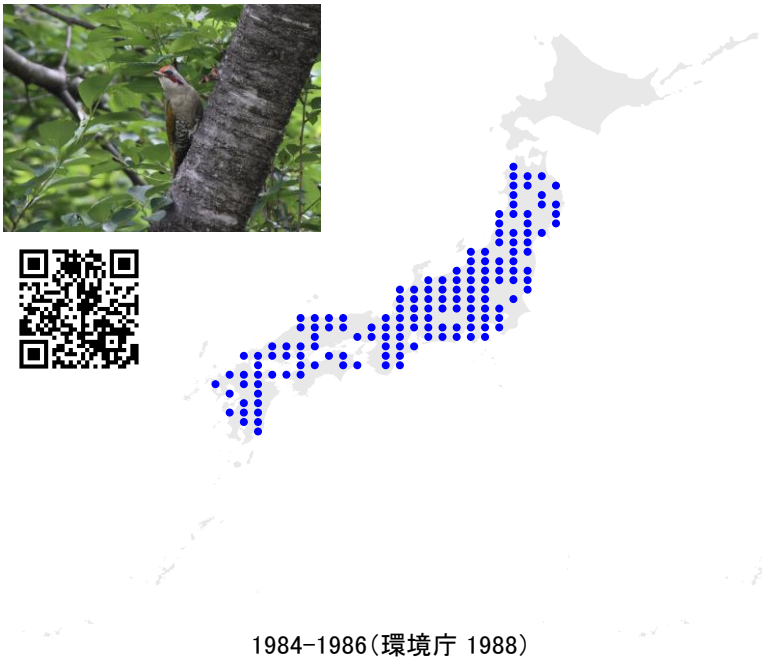


1984-1986（環境庁 1988）

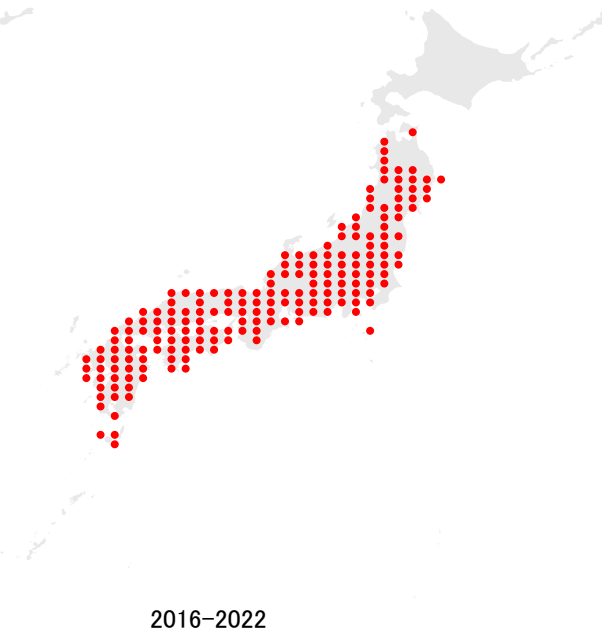


2016-2022

Japanese Green Woodpecker *Picus awokera* Length: 29cm Weight: 103-138g

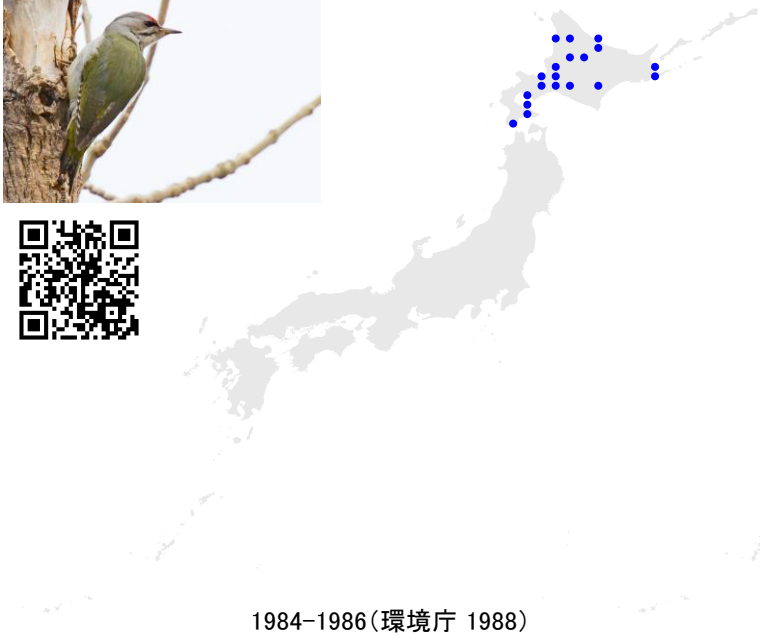


1984-1986（環境庁 1988）

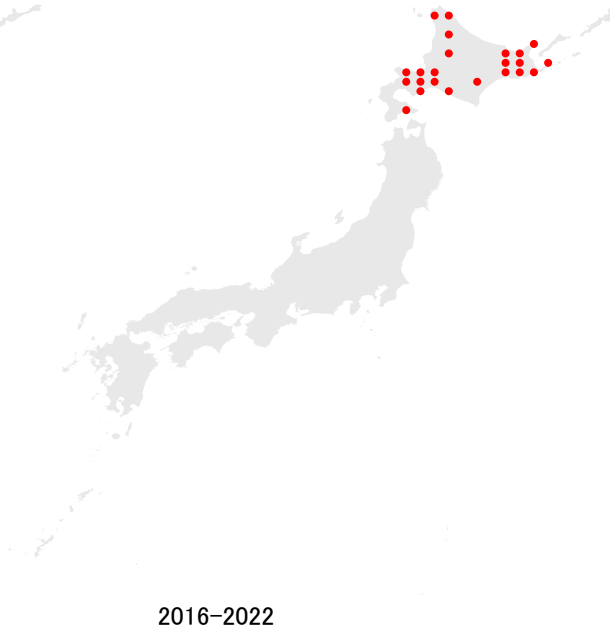


2016-2022

Grey-headed Woodpecker *Picus canus* Length: 26-30cm Weight: 120-170g

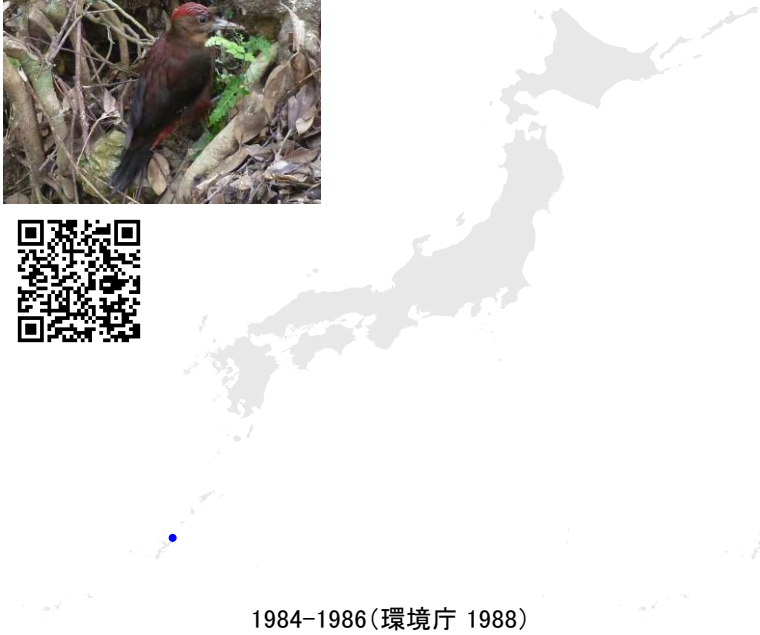


1984-1986（環境庁 1988）

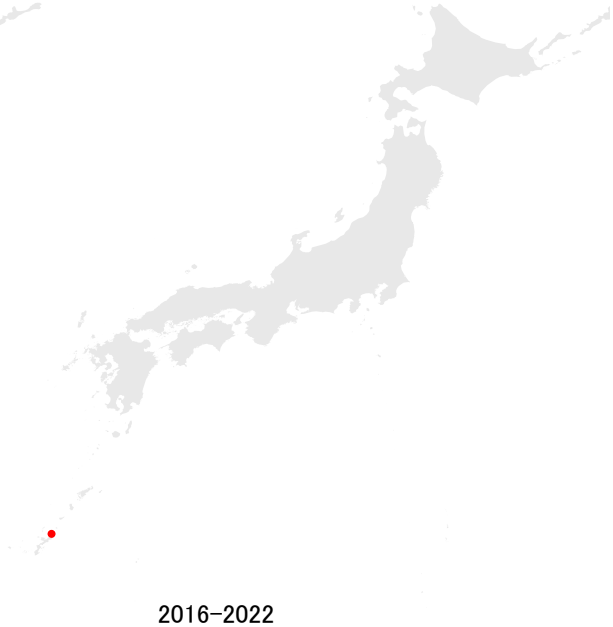


2016-2022

Okinawa Woodpecker *Sapheopipo noguchii* Length: 30cm Weight: ♂133.0-162.0g ♀116.0-150.0g

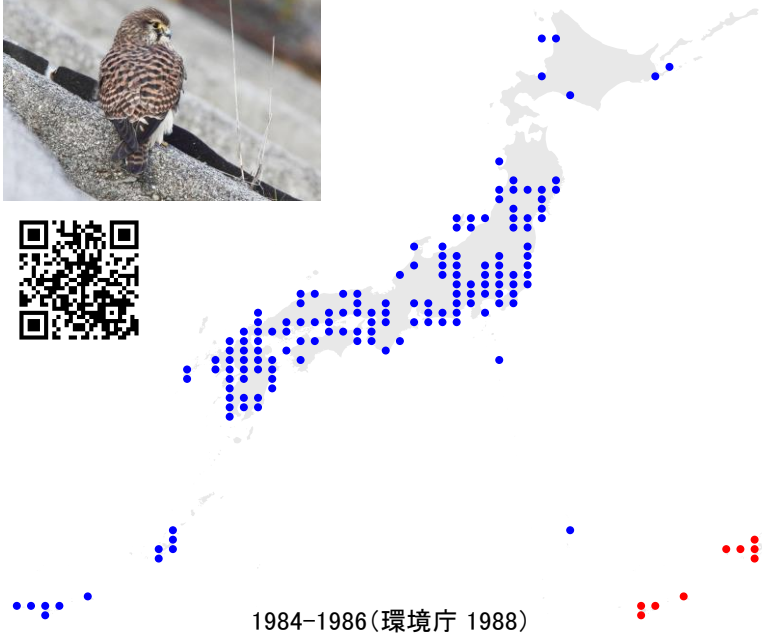


1984-1986（環境庁 1988）

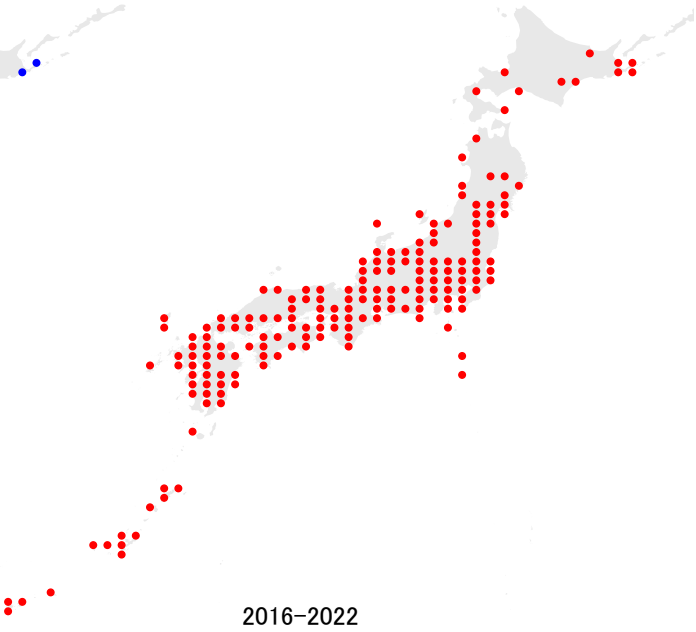


2016-2022

Common Kestrel *Falco tinnunculus* Length: 33.0-38.5cm Weight: ♂170-210g ♀122-202g

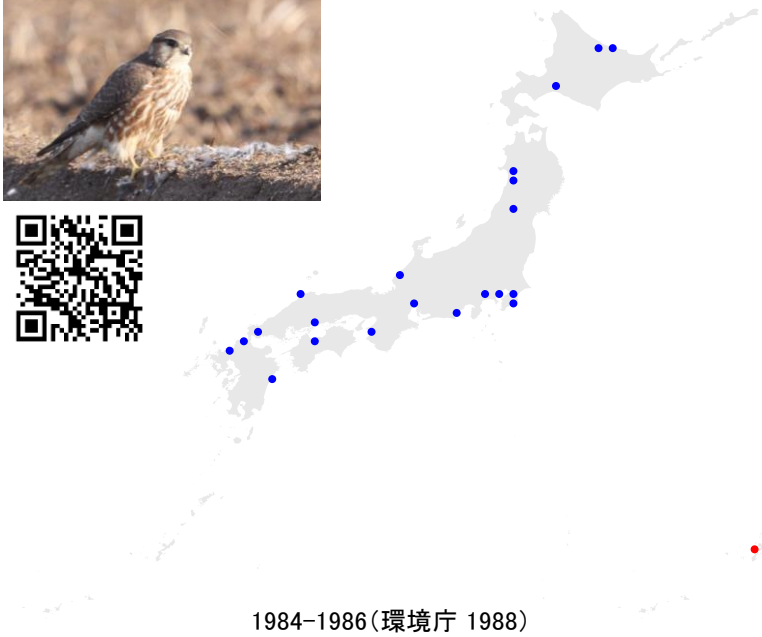


1984-1986（環境庁 1988）

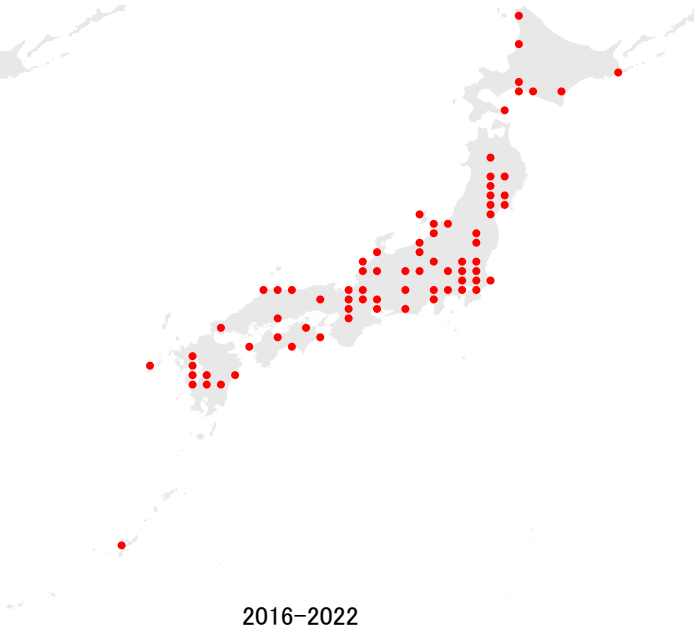


2016-2022

Merlin *Falco columbarius* Length: ♂28-31cm ♀32-34cm Weight: ♂140-193g ♀205-274g

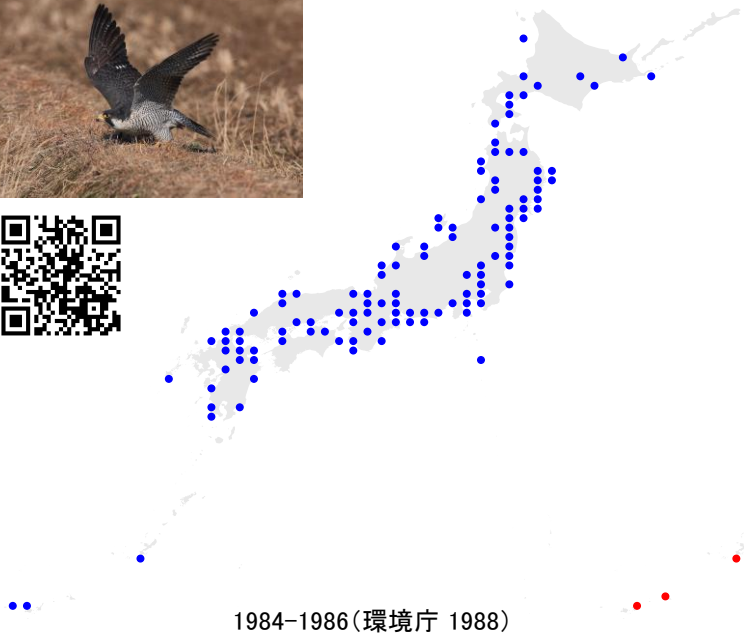


1984-1986（環境庁 1988）

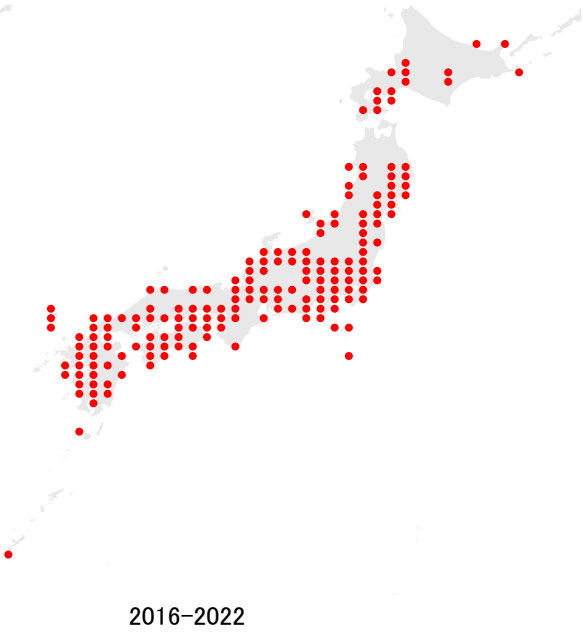


2016-2022

Peregrine Falcon *Falco peregrinus* Length: ♂35-40cm ♀45-50cm Weight: ♂500-680g ♀ 800-1200g



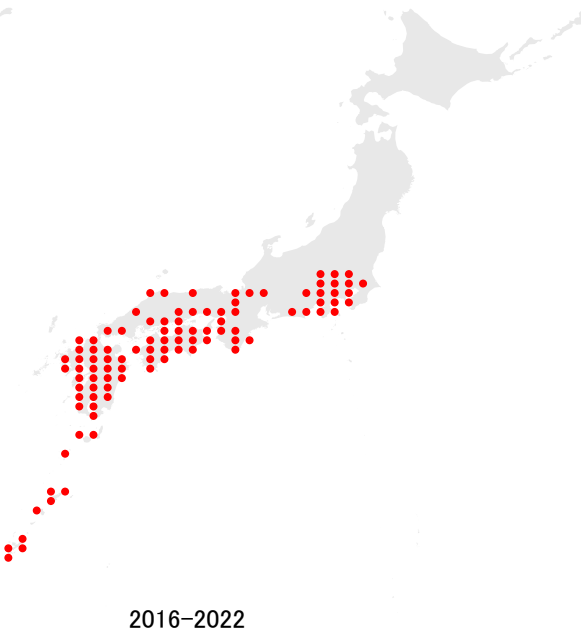
1984–1986（環境庁 1988）



2016–2022

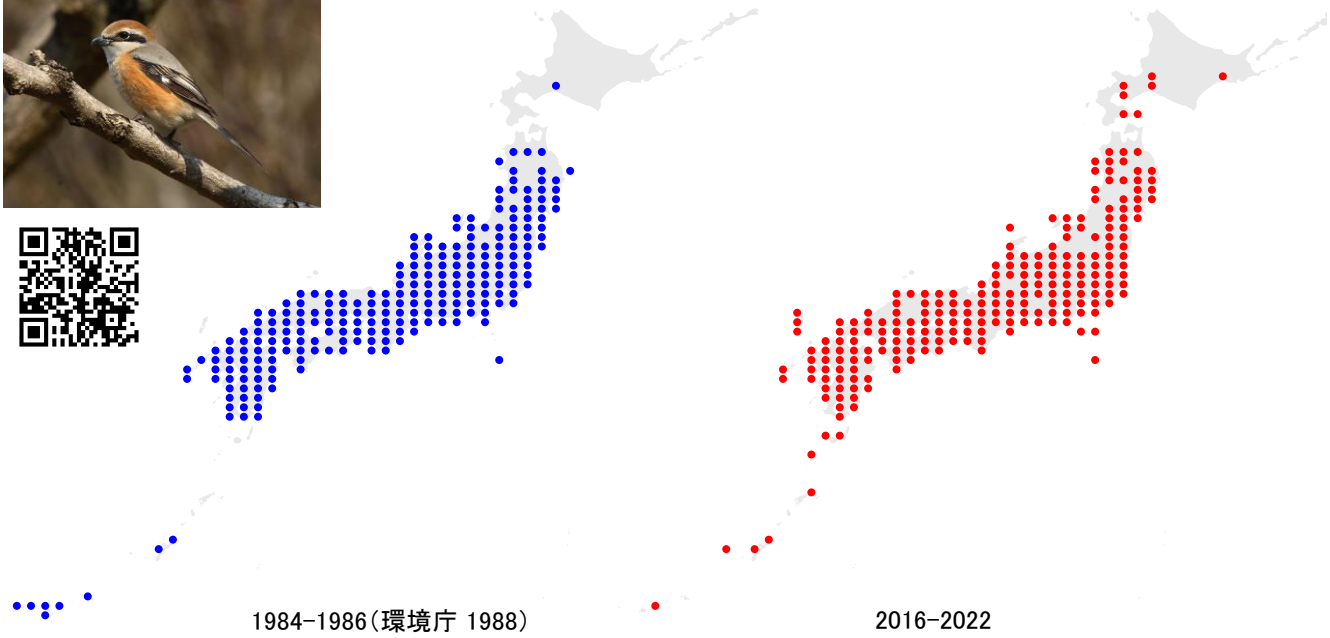
Ashy Minivet *Pericrocotus divaricatus* Length: 20cm Weight: 20-22g

1984–1986（環境庁 1988）

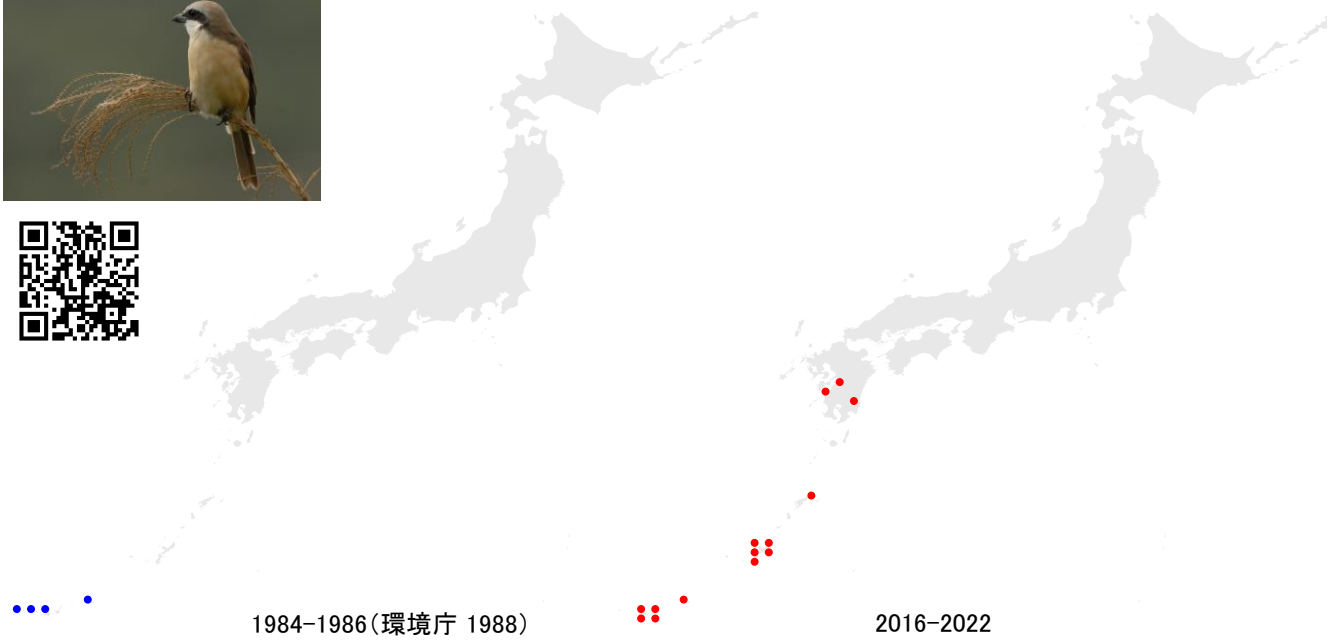


2016–2022

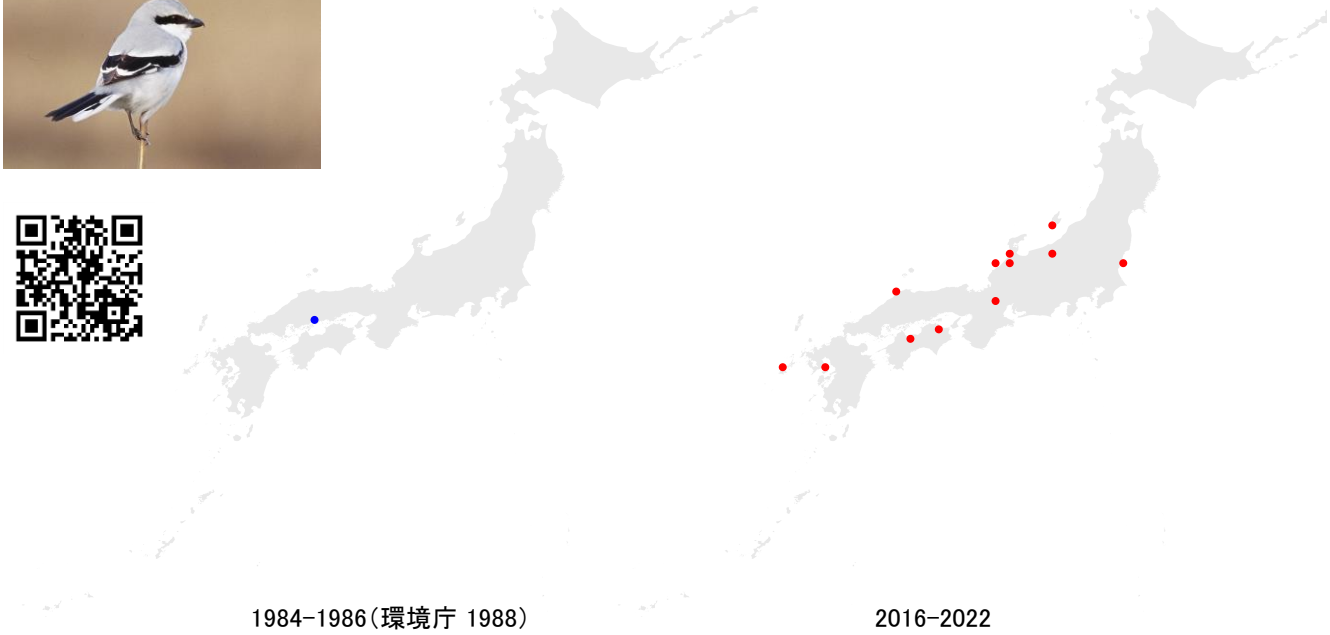
Bull-headed Shrike *Lanius bucephalus* Length: 18.5-21.2cm Weight: ♂35-46g ♀34-52g



Brown Shrike *Lanius cristatus* Length: 20cm Weight: ♂23.9-30.3g ♀24.8-35.0g

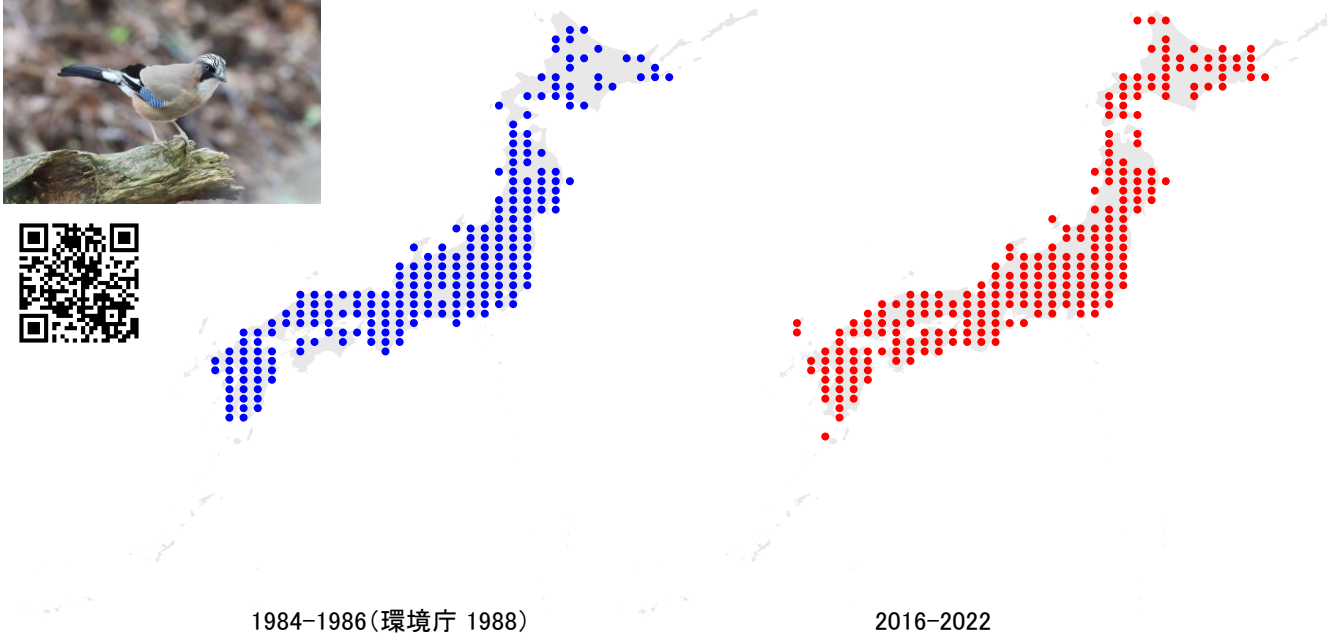


Chinese Grey Shrike *Lanius sphenocercus* Length: 31cm Weight: 85-100g



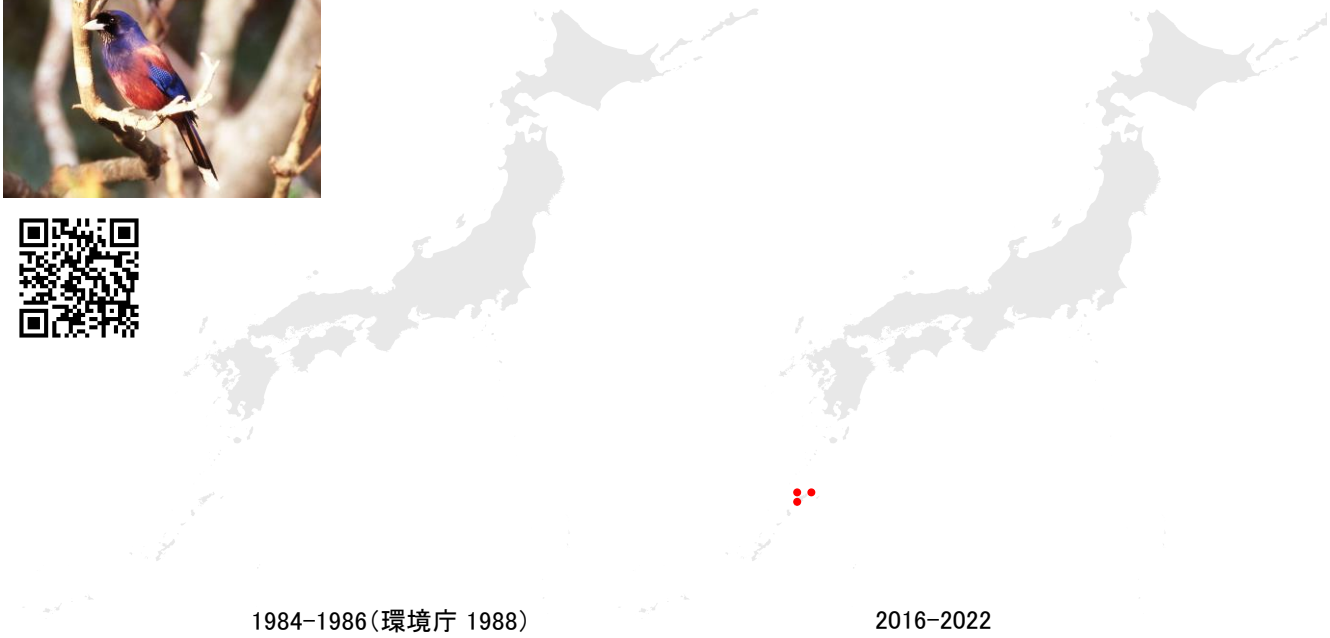
1984-1986（環境庁 1988） 2016-2022

Eurasian Jay *Garrulus glandarius* Length: 33cm Weight: 122-147g



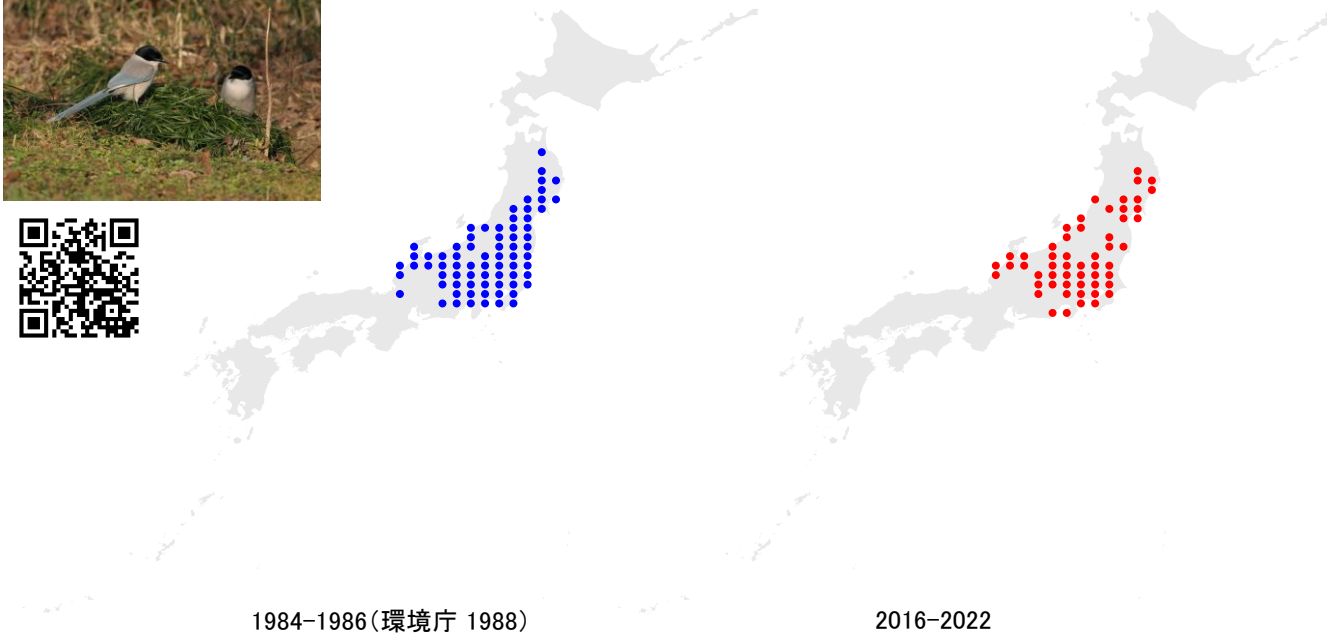
1984-1986（環境庁 1988） 2016-2022

Lidth's Jay *Garrulus lidthi* Length: 38cm Weight: ♂164.8-210.4g ♀170.5-194.7g



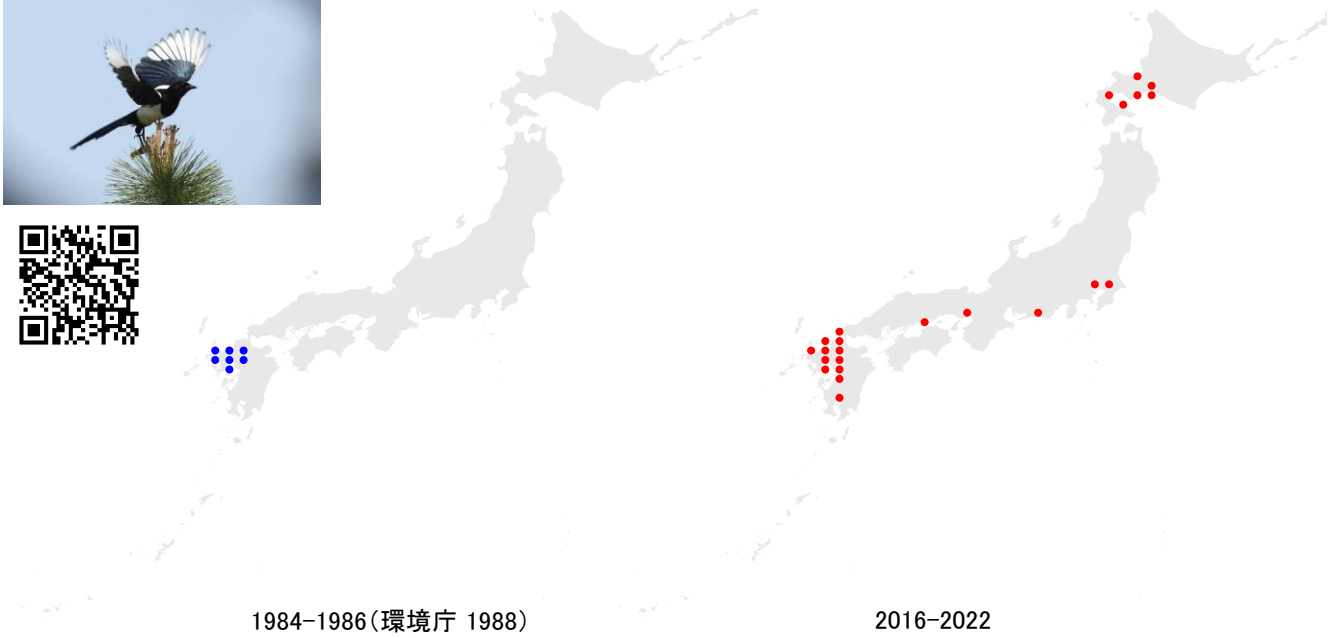
1984-1986(環境庁 1988) 2016-2022

Azure-winged Magpie *Cyanopica cyanus* Length: 31.9-39.0cm Weight: 69-96g

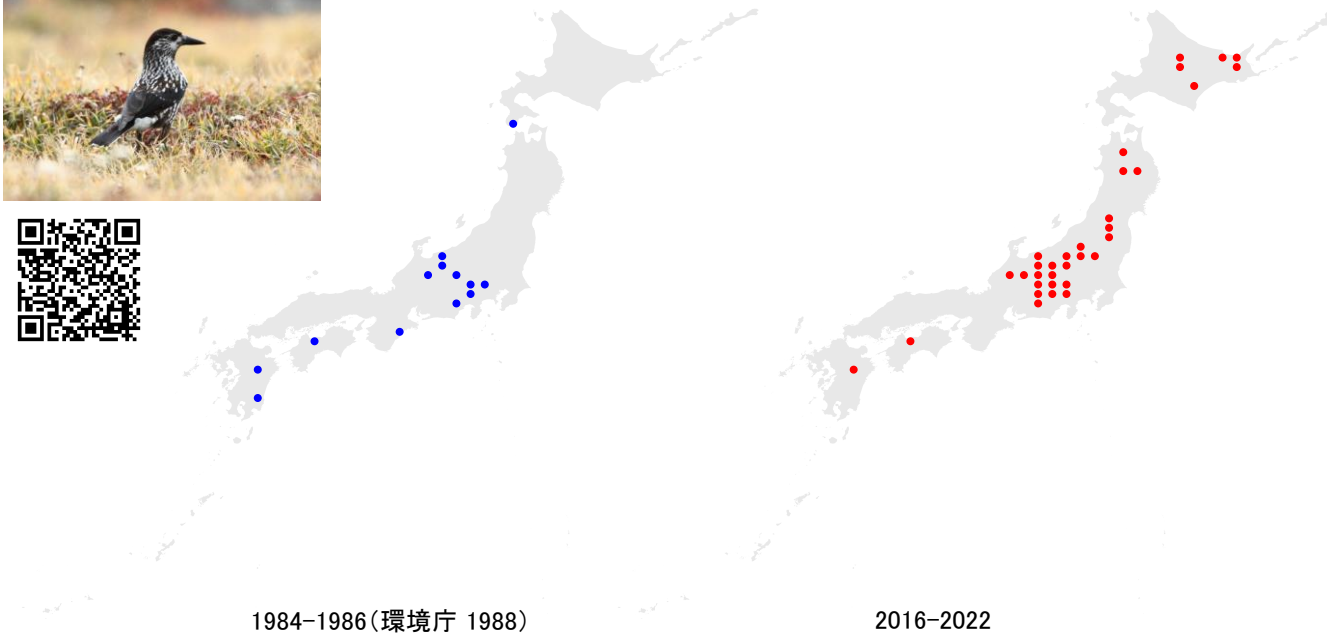


1984-1986(環境庁 1988) 2016-2022

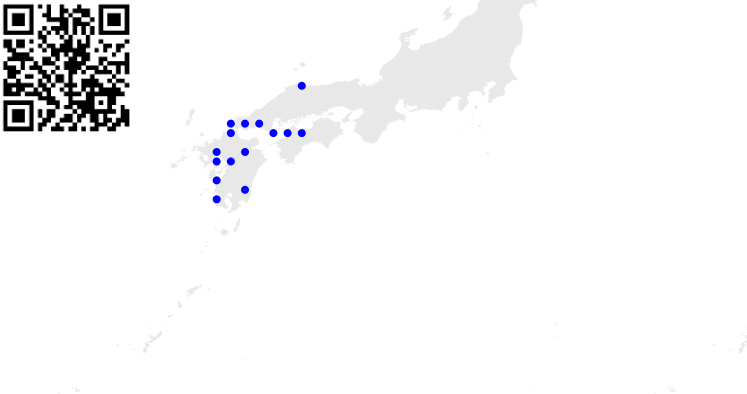
Eurasian Magpie *Pica pica* Length: 40.0-48.0cm Weight: 190-287g



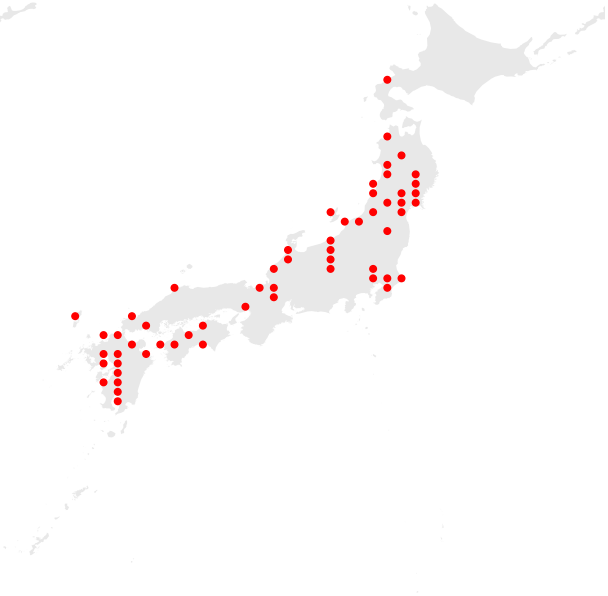
Spotted Nutcracker *Nucifraga caryocatactes* Length: 35cm Weight: 145-213g



Daurian Jackdaw *Corvus dauuricus* Length: 33cm Weight: 154-275g

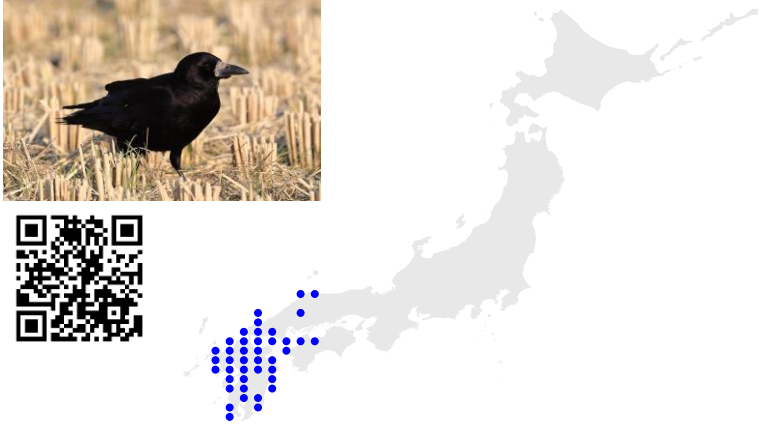


1984-1986（環境庁 1988）

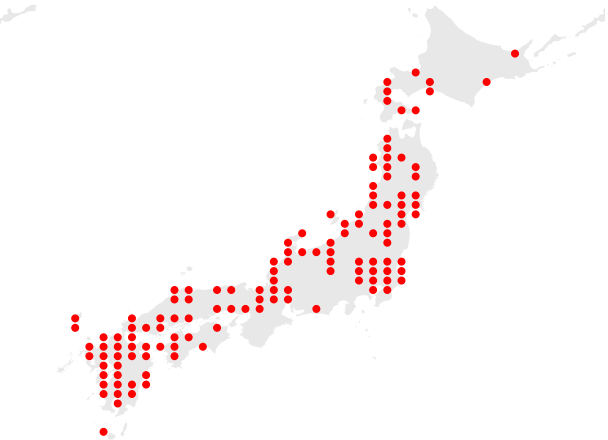


2016-2022

Rook *Corvus frugilegus* Length: 47cm Weight: 325-516g

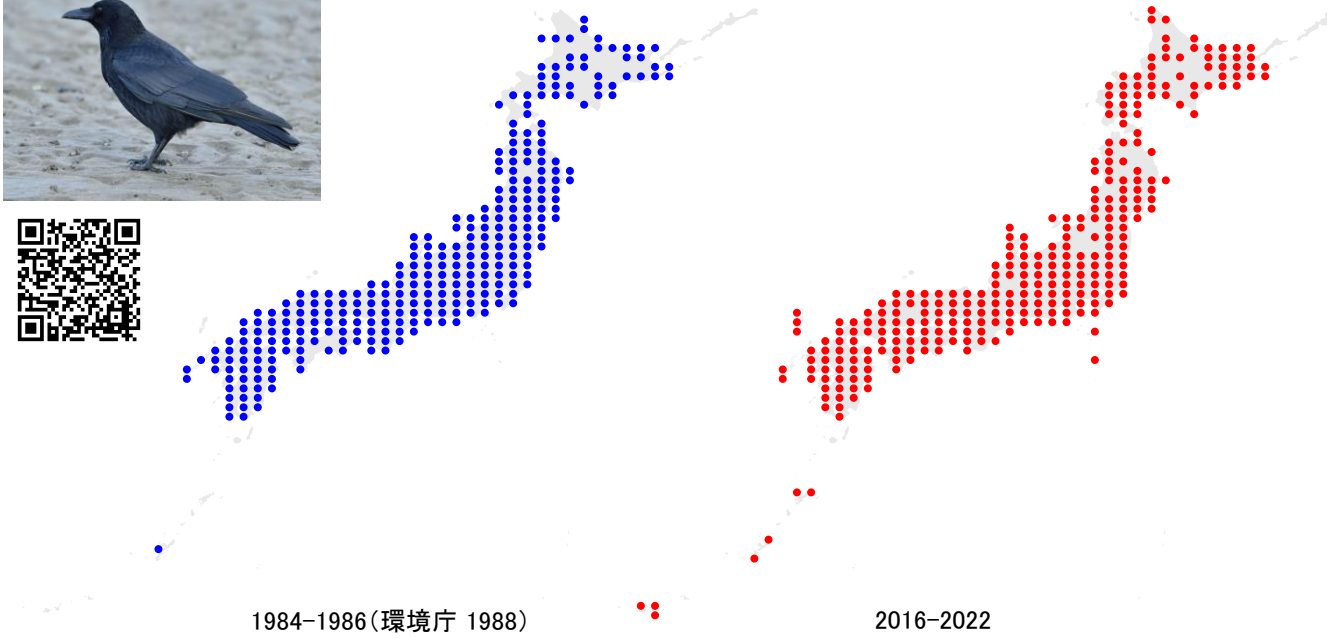


1984-1986（環境庁 1988）

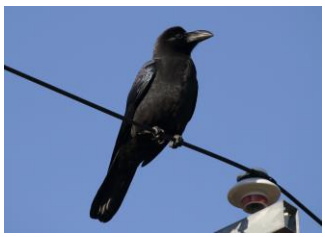


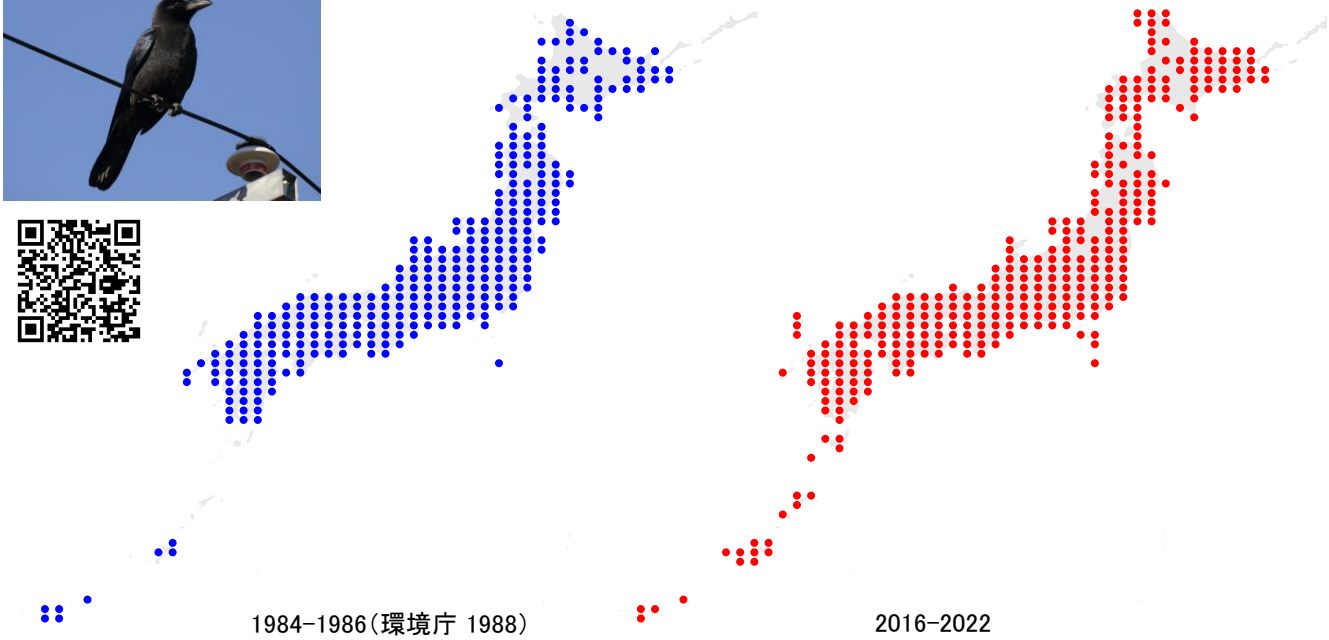
2016-2022

Carrion Crow *Corvus corone* Length: 46.2-54.0cm Weight: ♂460-685g ♀370-620g



Large-billed Crow *Corvus macrorhynchos* Length: 54-60cm Weight: 570-895g





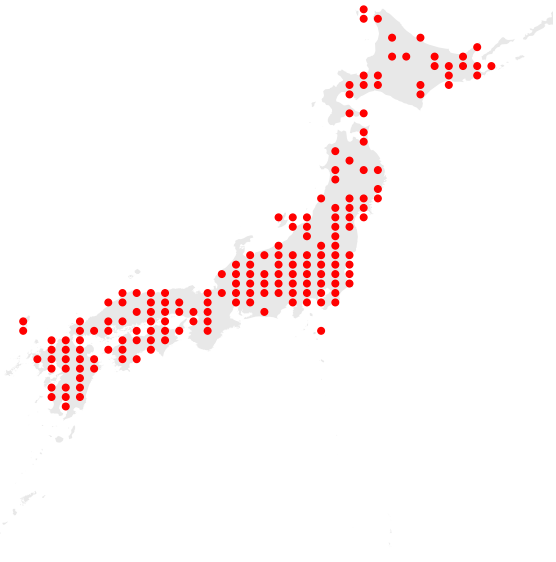
Northern Raven *Corvus corax* Length: 61cm Weight: 1250g

1984-1986(環境庁 1988)

2016-2022

Goldcrest *Regulus regulus* Length: 10cm Weight: 3-6g

1984-1986(環境庁 1988)



2016-2022

Chinese Penduline Tit *Remiz pendulinus* Length: 11cm Weight: 7-11g

1984-1986（環境庁 1988）

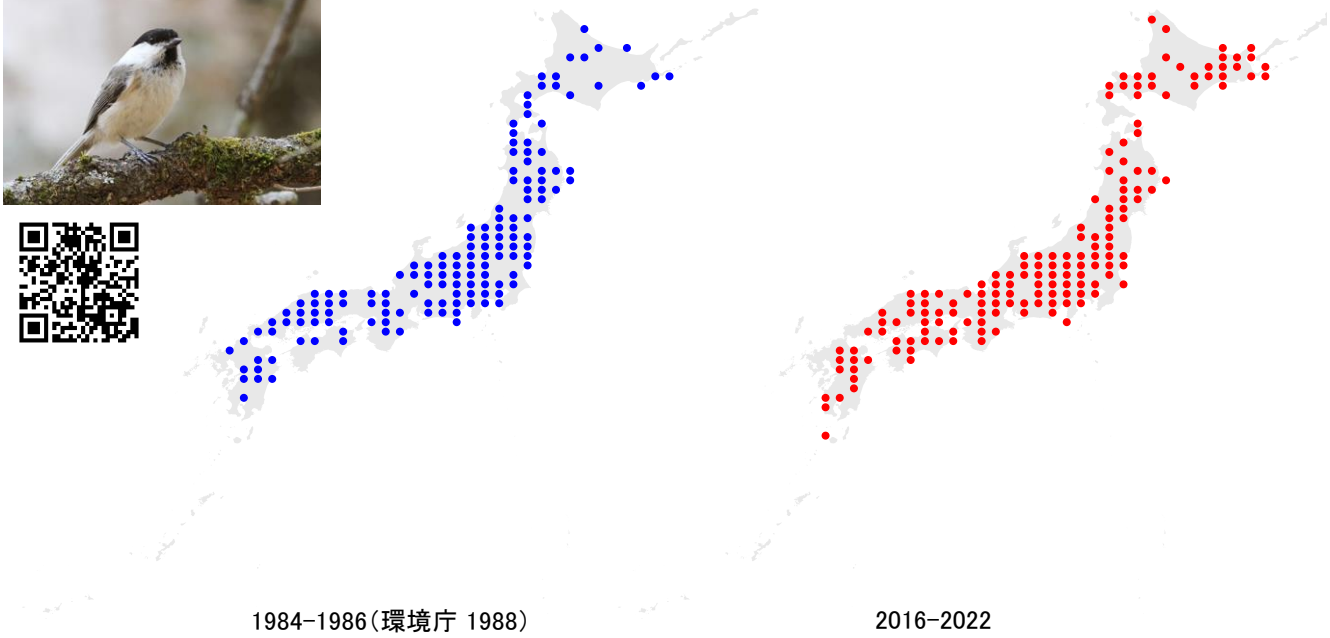
2016-2022

Marsh Tit *Poecile palustris* Length: 12-14cm Weight: 12.1±0.7g

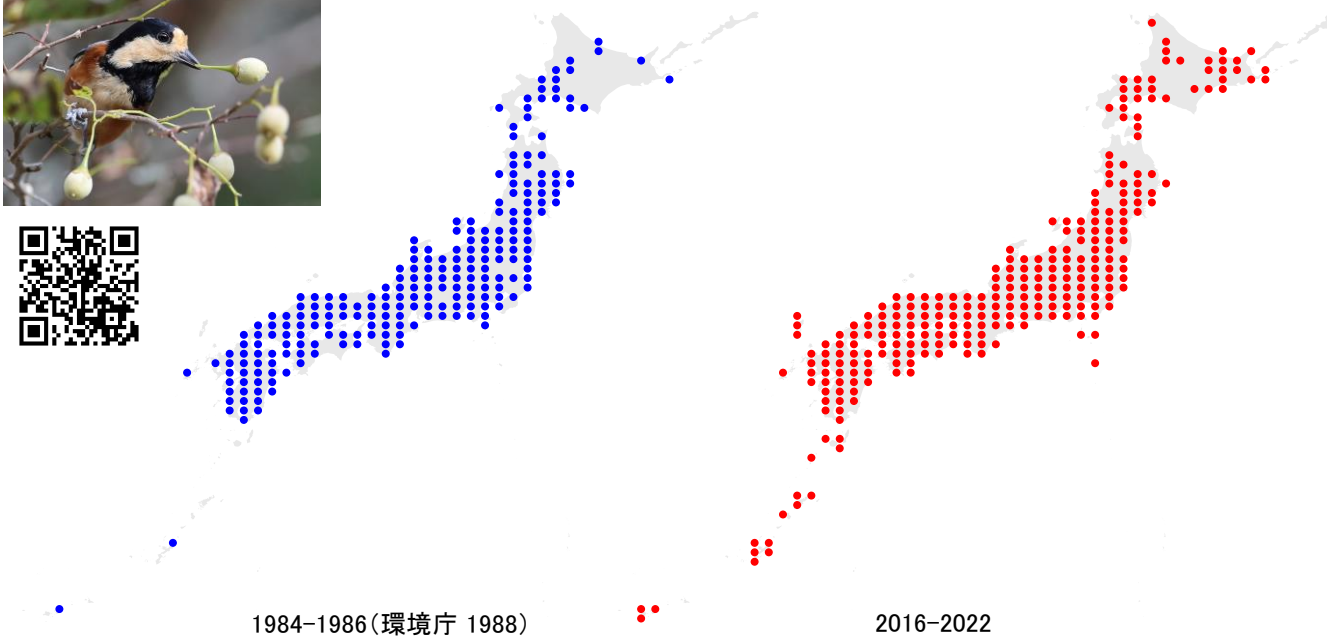
1984-1986（環境庁 1988）

2016-2022

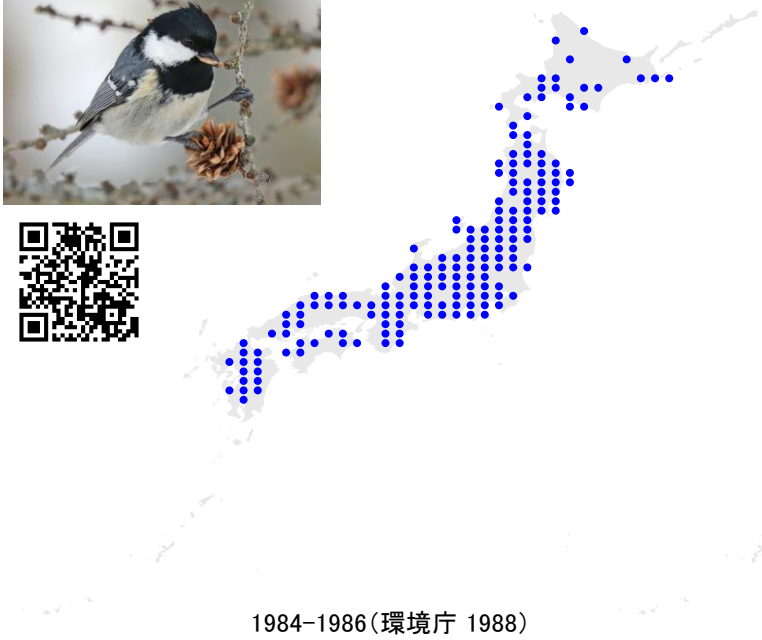
Willow Tit *Poecile montanus* Length: 11.9-12.8cm Weight: 11.3±0.5g



Varied Tit *Poecile varius* Length: 14cm Weight: ♂16.33±1.07g ♀15.33±0.60g



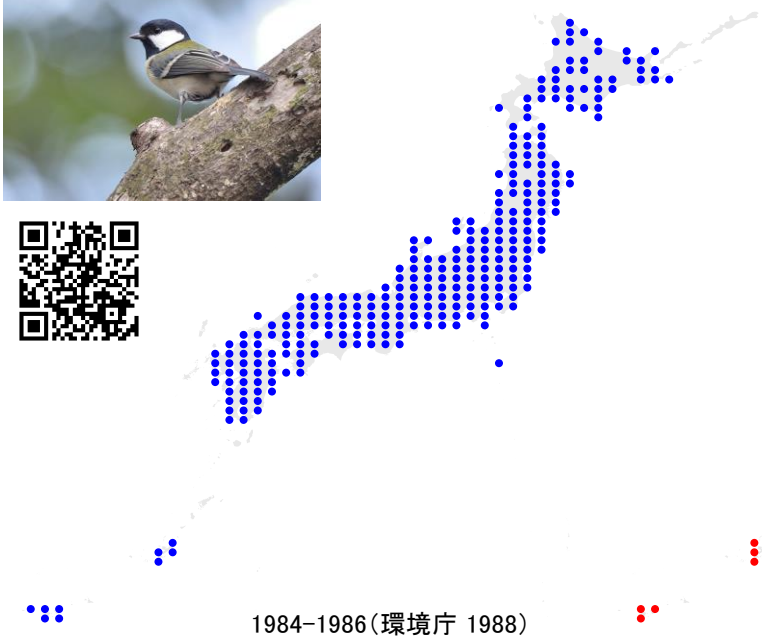
Coal Tit *Periparus ater* Length: 10-12cm Weight: 6-10g



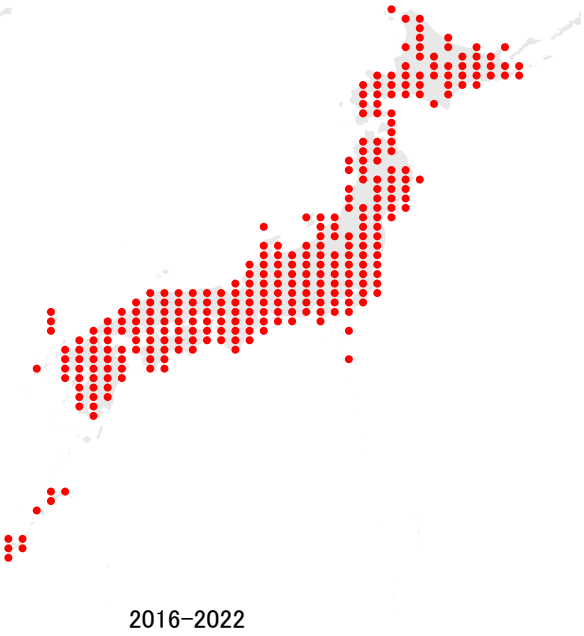
1984-1986（環境庁 1988）

2016-2022

Japanese Tit *Parus minor* Length: 13.7-14.8cm Weight: ♂15.7±0.9g ♀15.0±0.8g

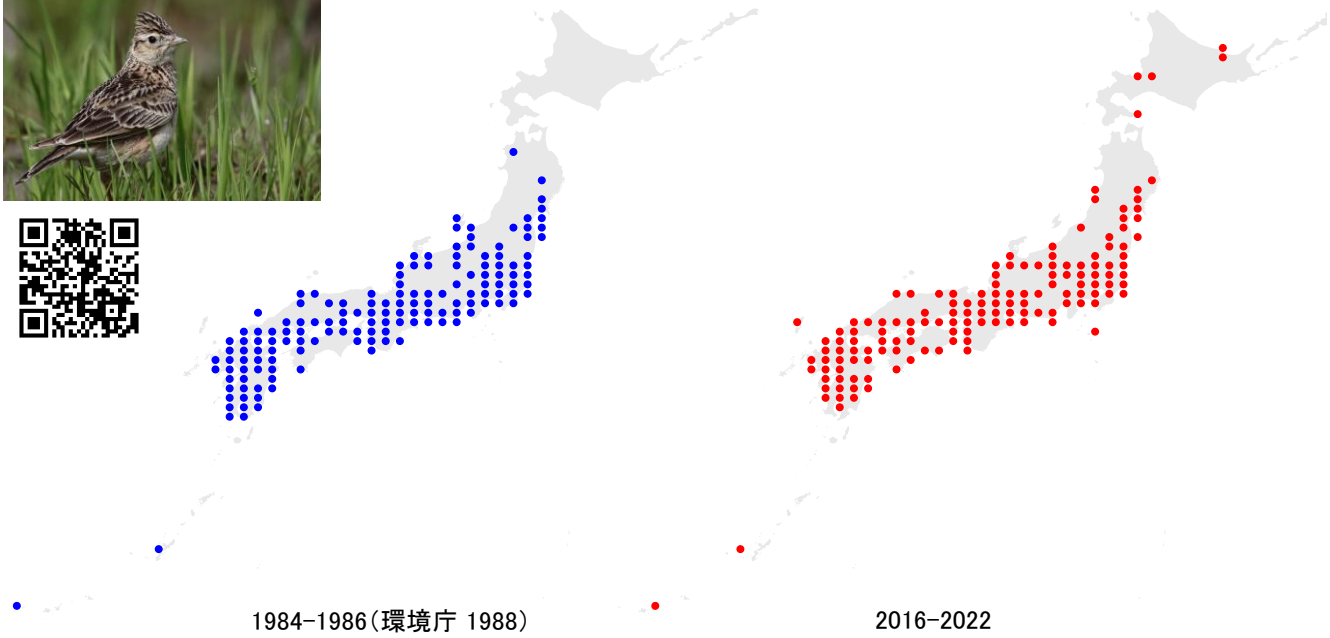


1984-1986（環境庁 1988）

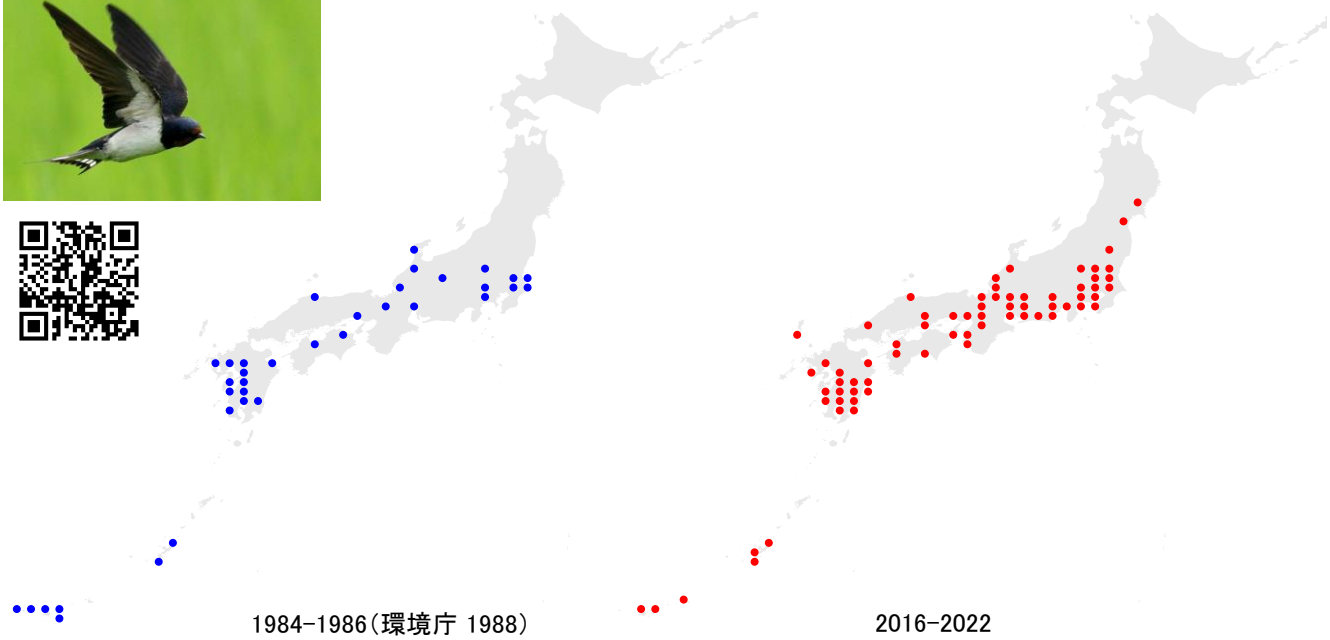


2016-2022

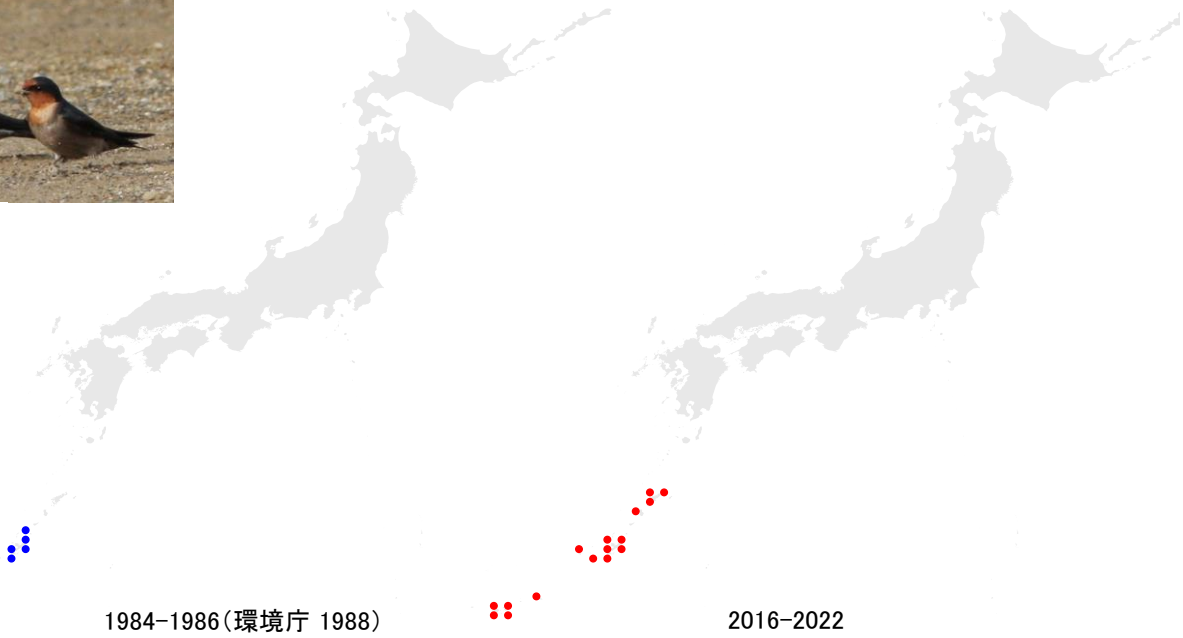
Eurasian Skylark *Alauda arvensis* Length: 16.1-17.2cm Weight: 29.2-37.5g



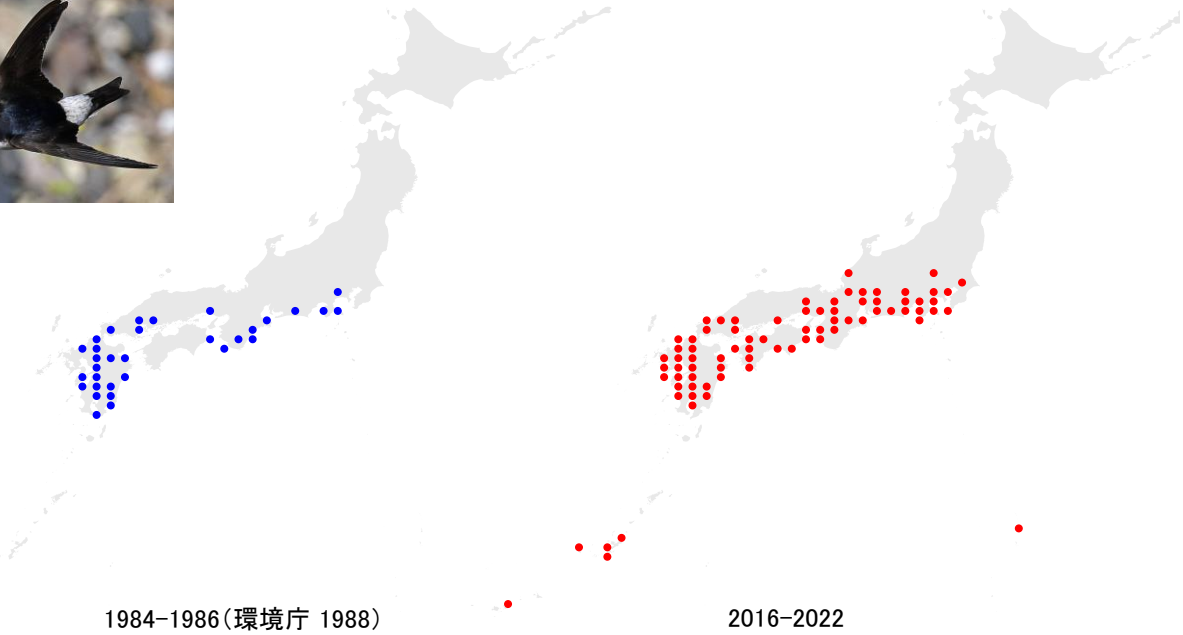
Barn Swallow *Hirundo rustica* Length: 14.6-18.5cm Weight: 15.6-24.0g



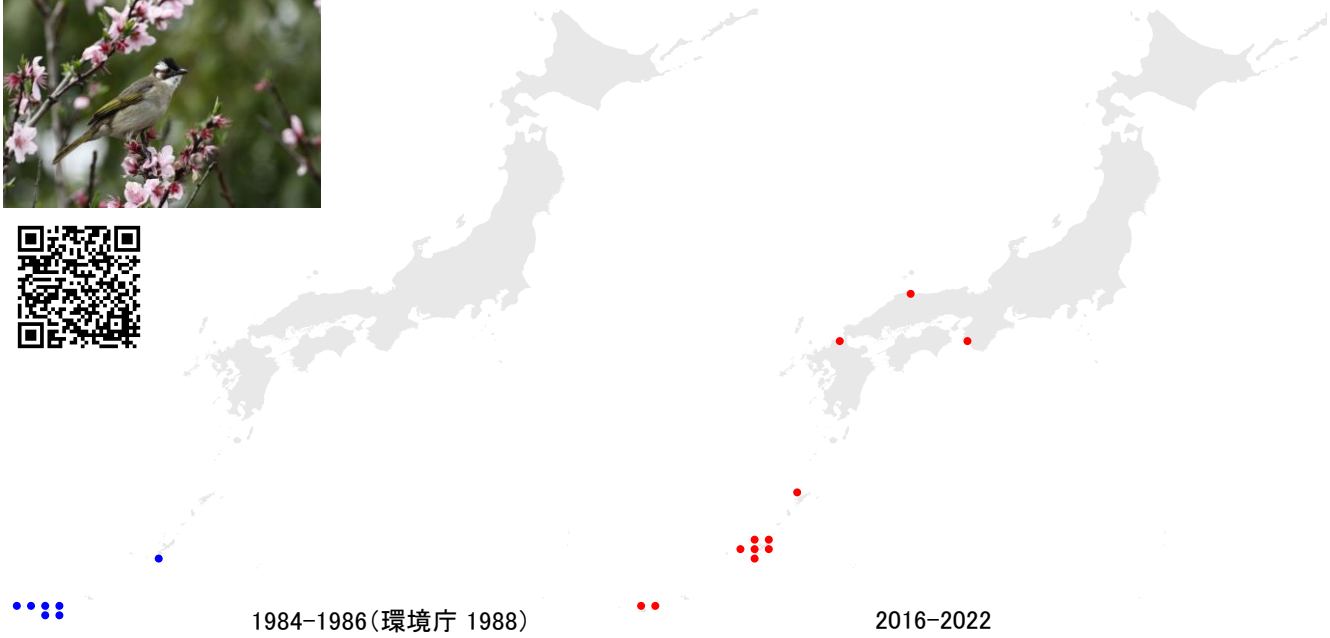
Pacific Swallow *Hirundo tahitica* Length: 13cm Weight: 13g



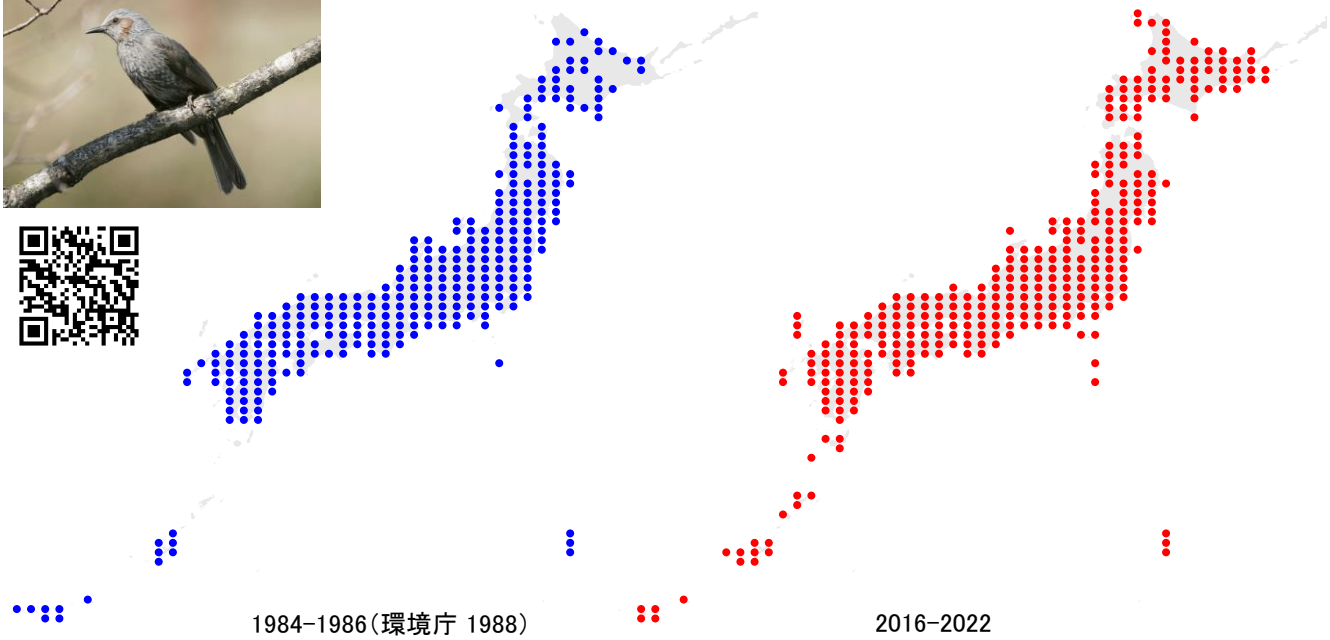
Asian House Martin *Delichon dasypus* Length: 13cm Weight: ♂18.1±1.0g ♀ 17.7±0.9g



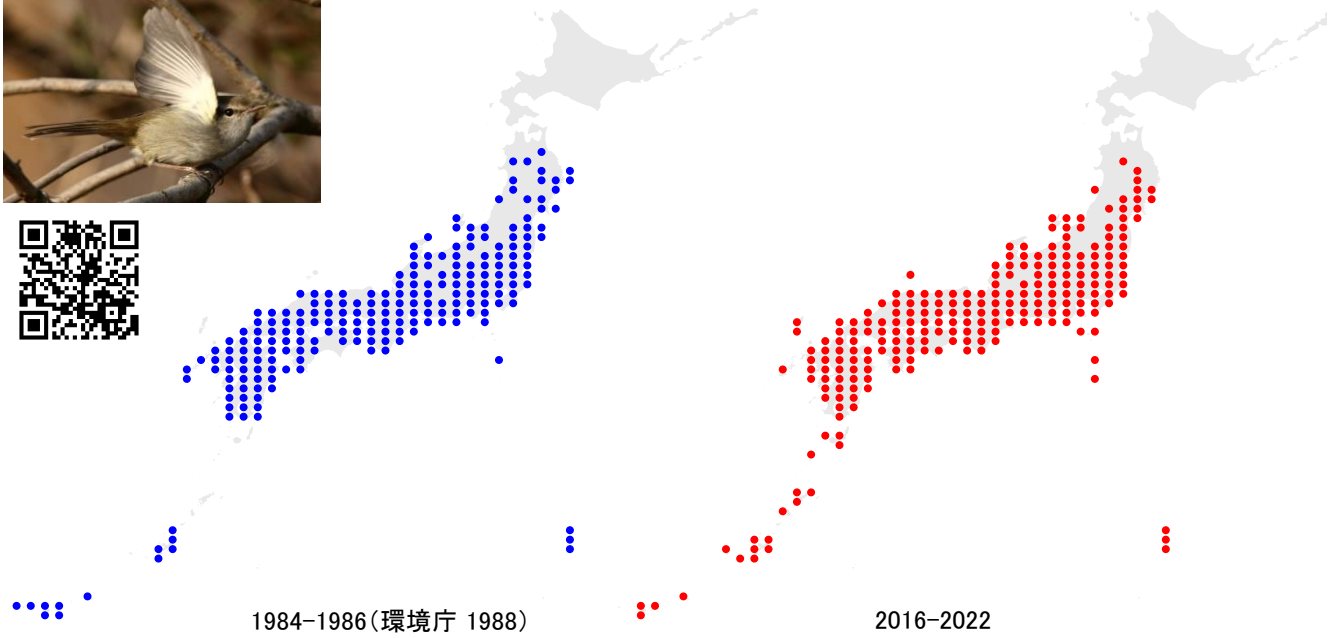
Light-vented Bulbul *Pycnonotus sinensis* Length: 19cm Weight: 75g



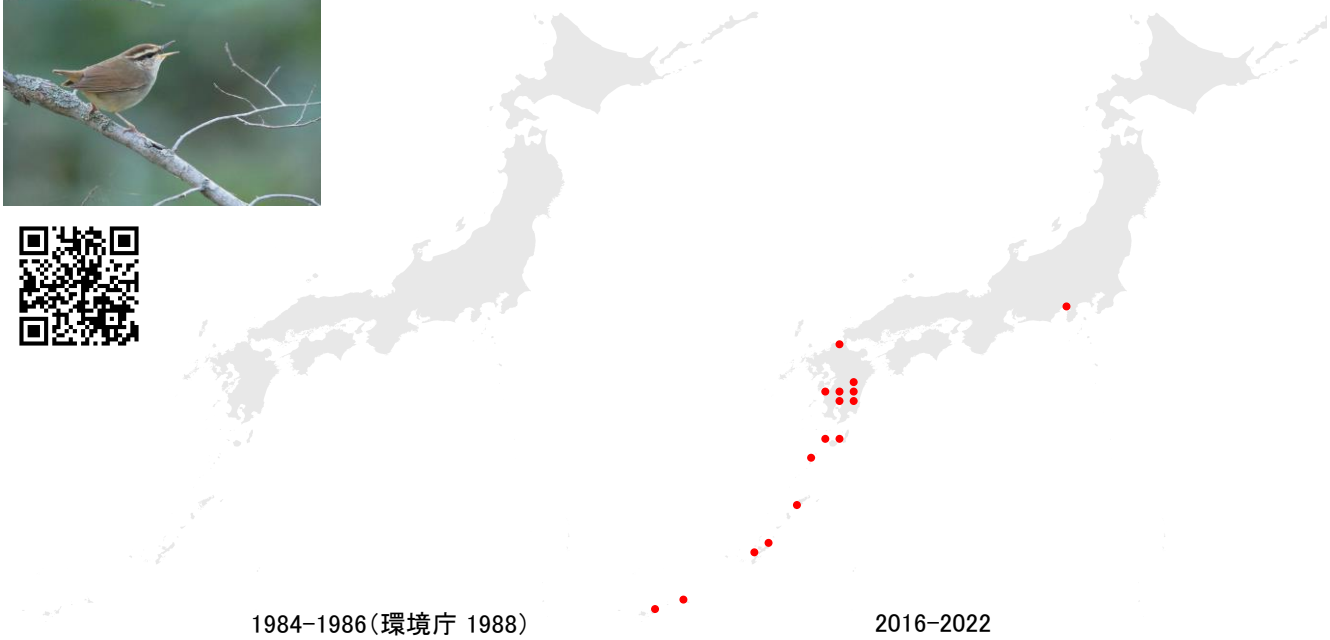
Brown-eared Bulbul *Hypsipetes amaurotis* Length: 24.9-29.0cm Weight: 79.9±12.1g



Japanese Bush Warbler *Cettia diphone* Length: 14.0-15.5cm Weight: ♂14.8-22.3g ♀10.0-13.7g

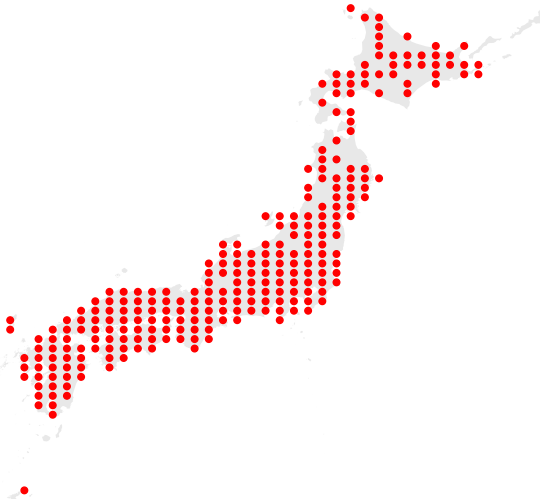


Asian Stubtail *Urosphena squameiceps* Length: 10.5cm Weight: ♂9.3±0.6g ♀9.3±0.6g



Long-tailed Tit *Aegithalos caudatus* Length: 12.5-14.5cm Weight: 5.6-9.4g

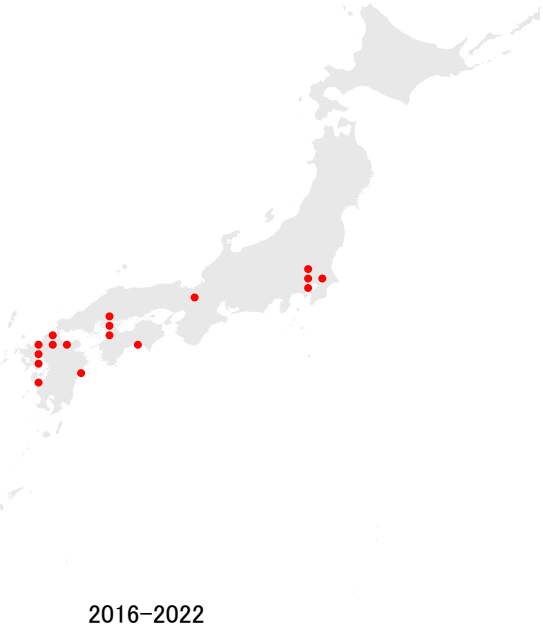
1984-1986（環境庁 1988）



2016-2022

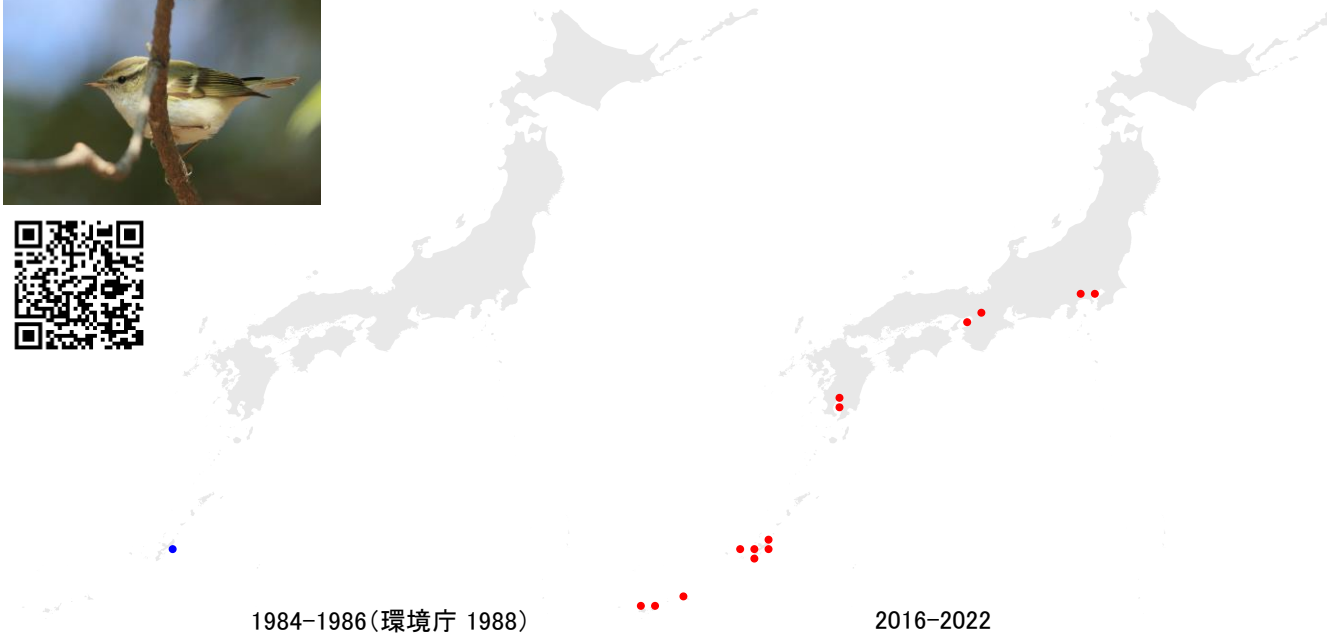
Dusky Warbler *Phylloscopus fuscatus* Length: 11cm Weight: 6-13g

1984-1986（環境庁 1988）



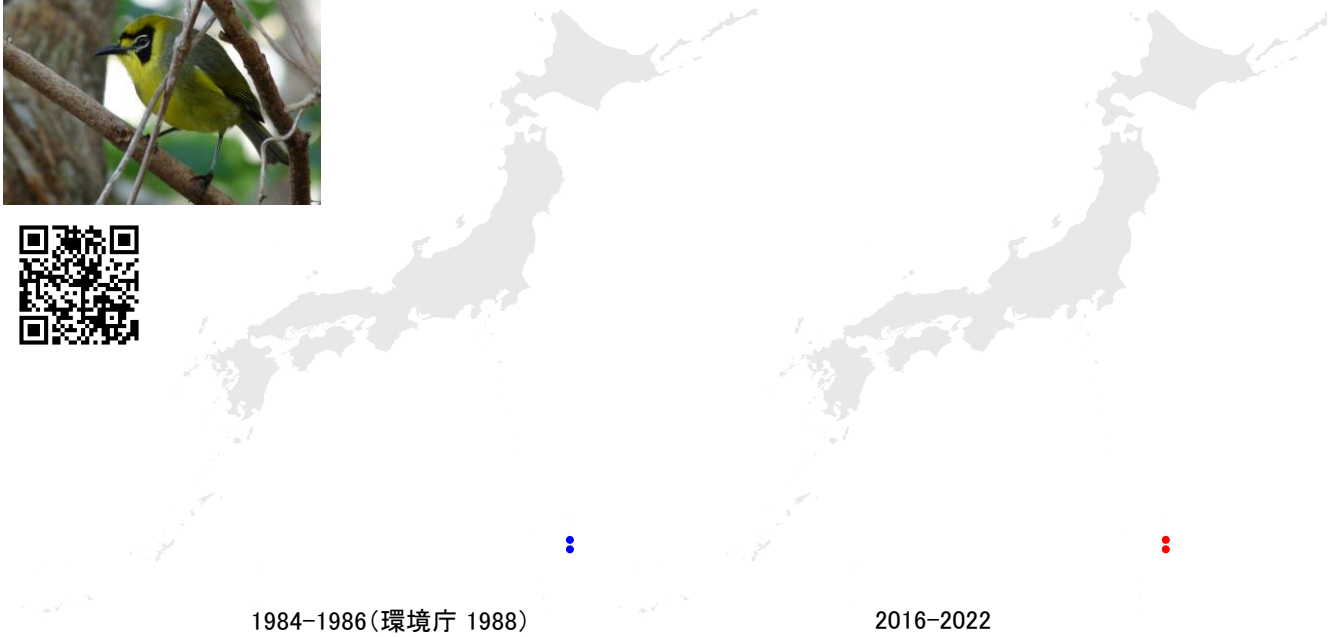
2016-2022

Yellow-browed Warbler *Phylloscopus inornatus* Length： 10-11cm Weight： 5-9g



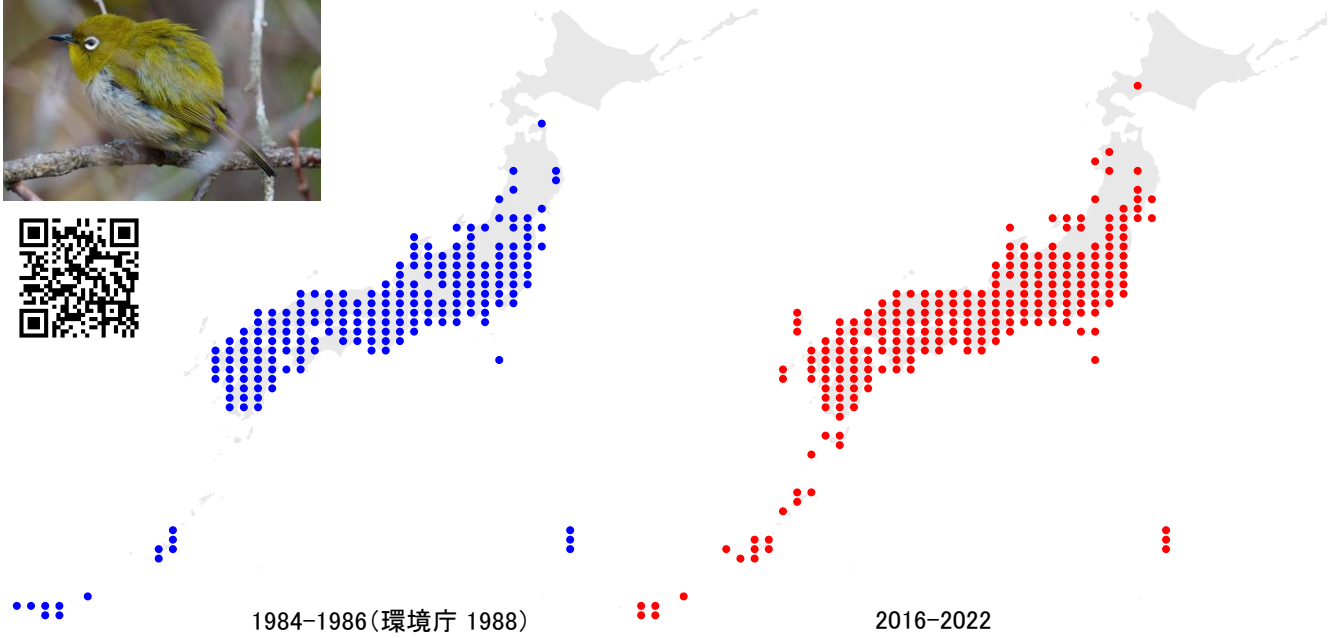
1984−1986（環境庁 1988） 2016−2022

Bonin White-eye *Apalopteron familiare* Length： 14.0cm Weight： 13-17g

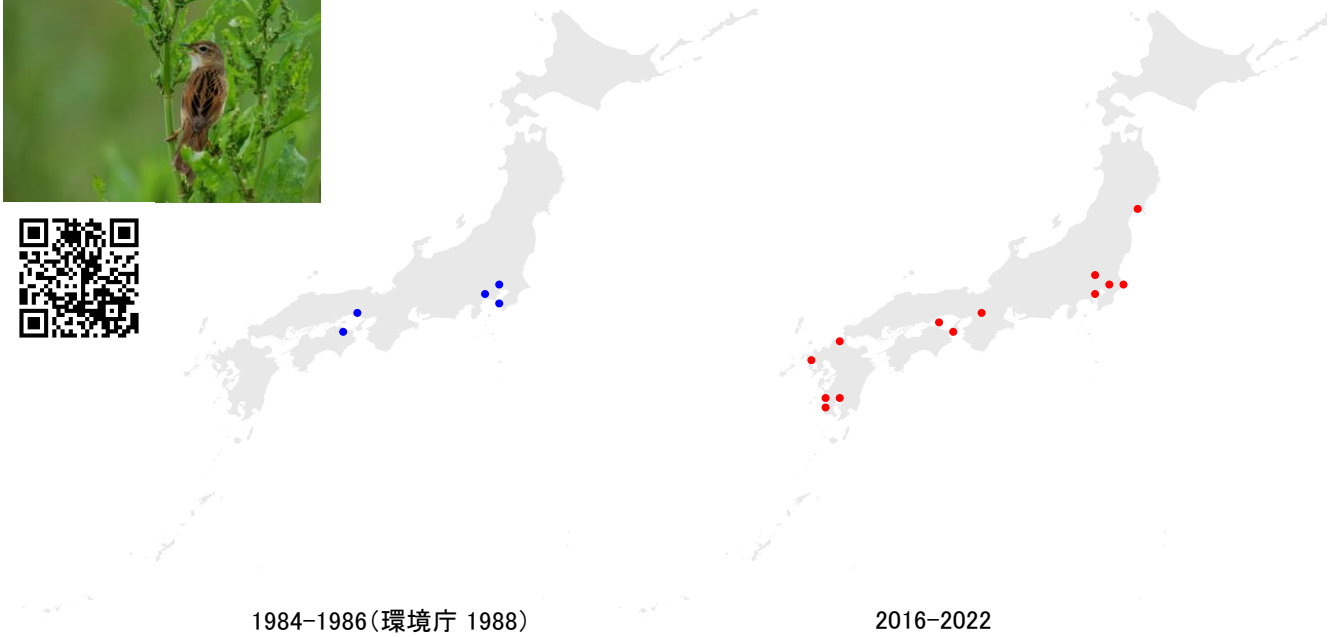


1984−1986（環境庁 1988） 2016−2022

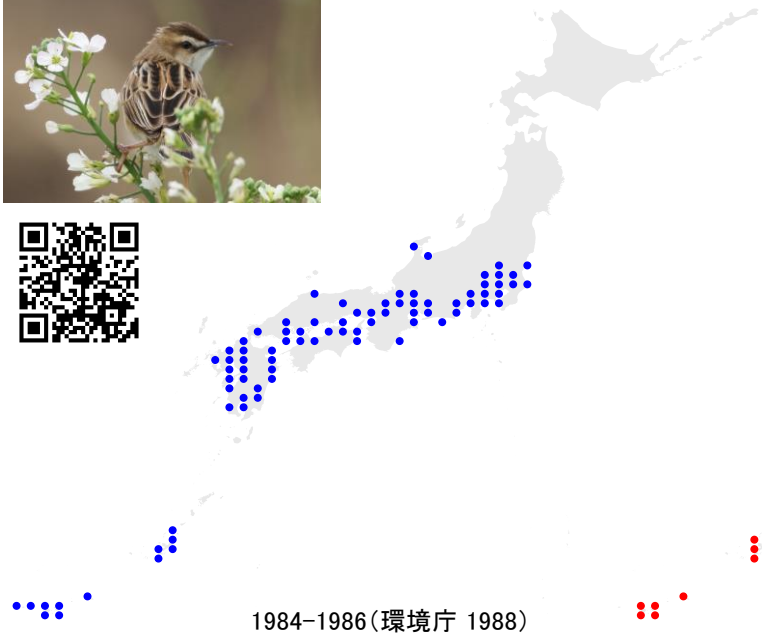
Warbling White-eye *Zosterops japonicus* Length: 11.1±0.3cm Weight: 11.3±1.9g



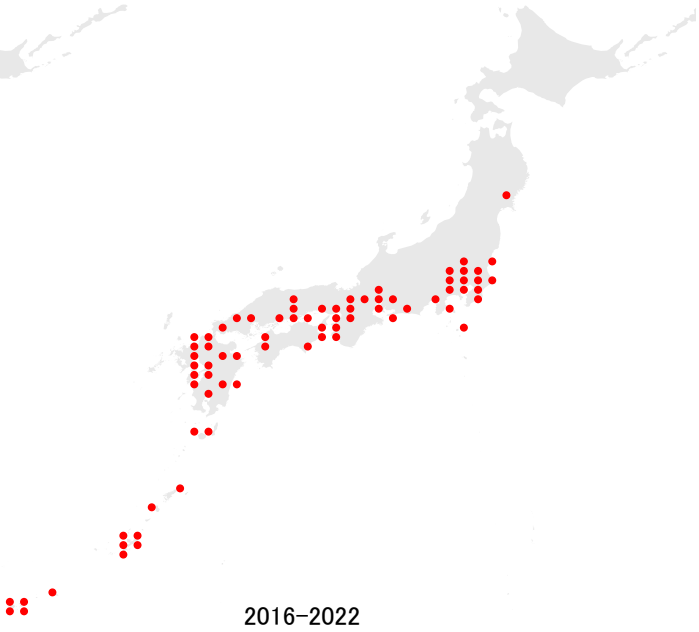
Marsh Grassbird *Locustella pryeri* Length: ♂12.6±0.4cm ♀11.9±0.4cm Weight: ♂14.5±0.8g ♀12.6±1.5g



Zitting Cisticola *Cisticola juncidis* Length: 11.2-13.0cm Weight: 10g

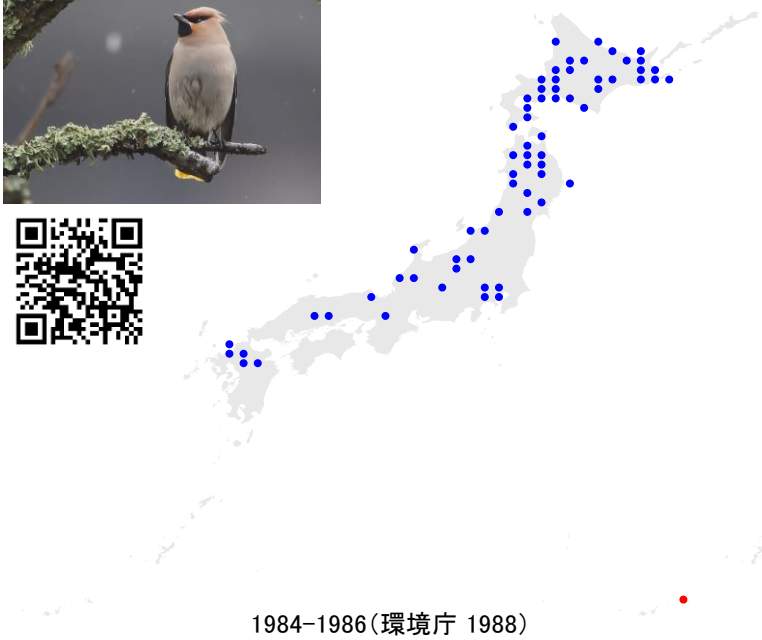


1984-1986(環境庁 1988)

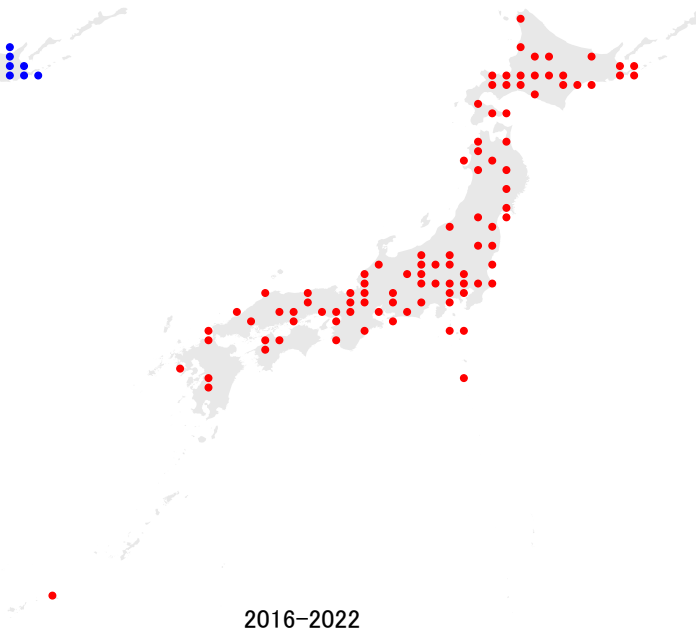


2016-2022

Bohemian Waxwing *Bombycilla garrulus* Length: 20cm Weight: 31-70g

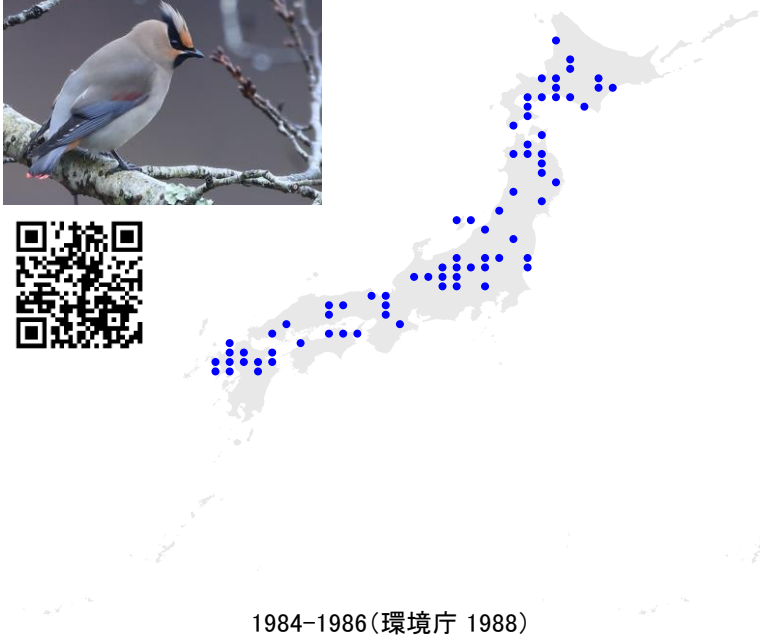


1984-1986(環境庁 1988)

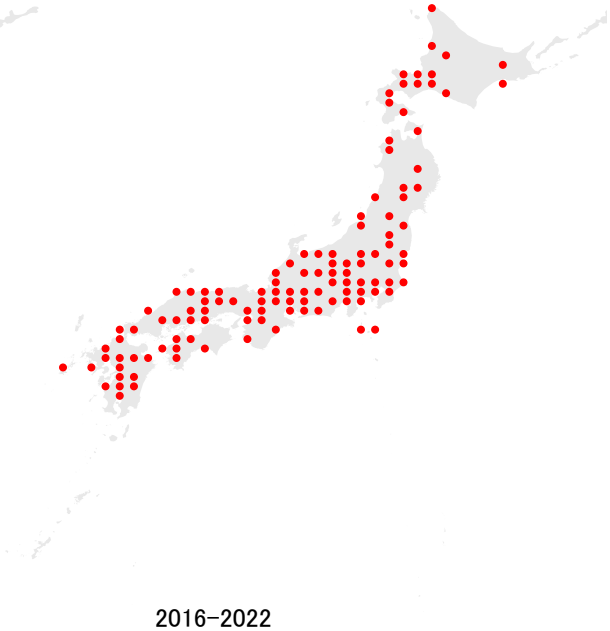


2016-2022

Japanese Waxwing *Bombycilla japonica* Length: 18cm Weight: 40-47g

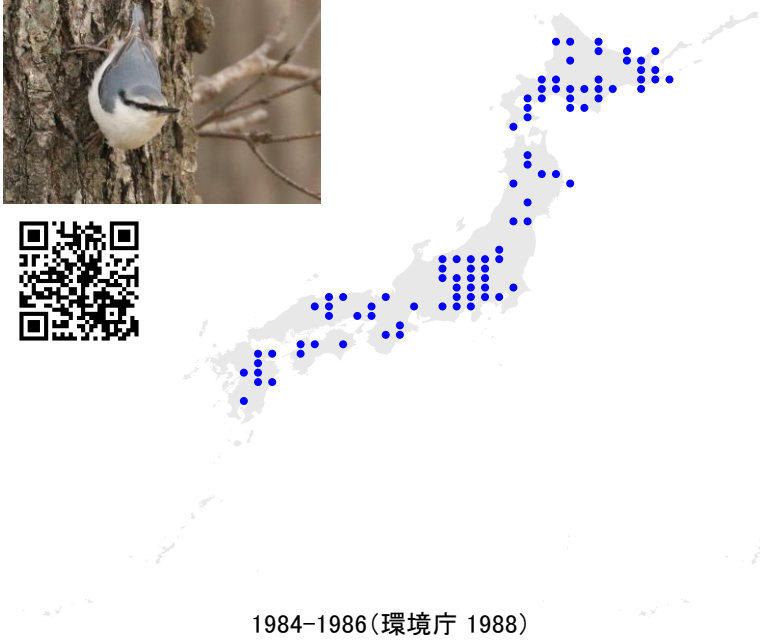


1984-1986（環境庁 1988）

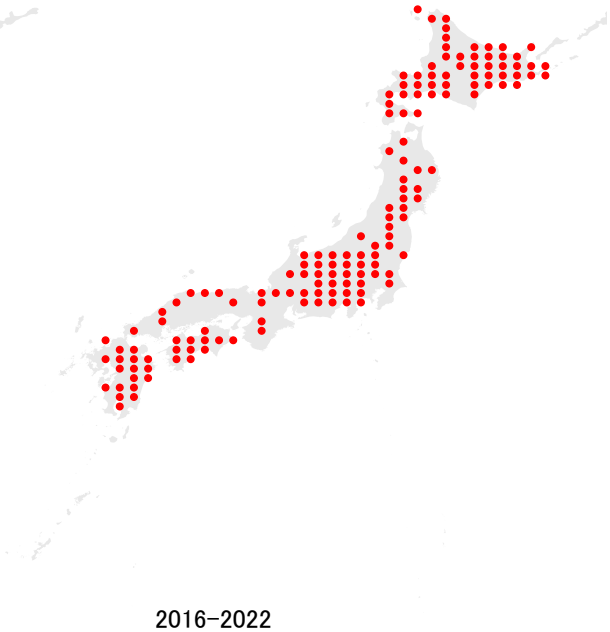


2016-2022

Eurasian Nuthatch *Sitta europaea* Length: 14cm Weight: 18-21g

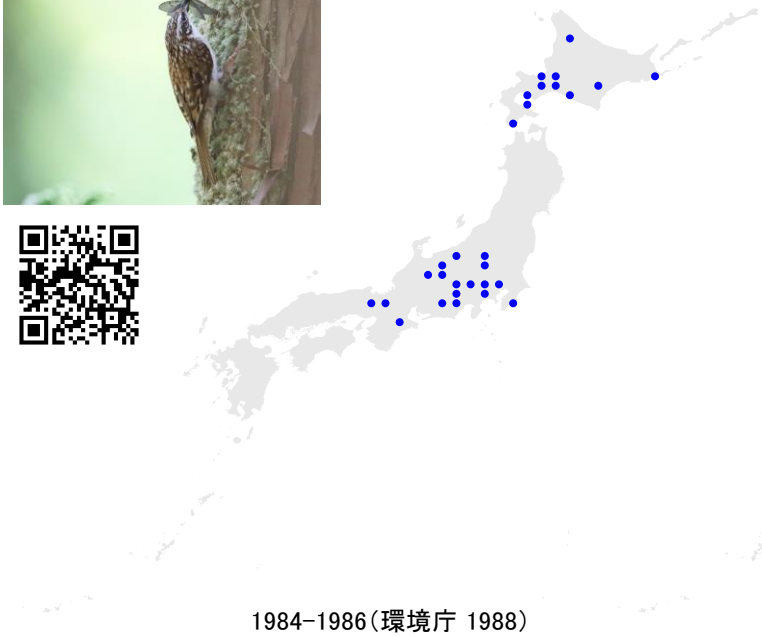


1984-1986（環境庁 1988）

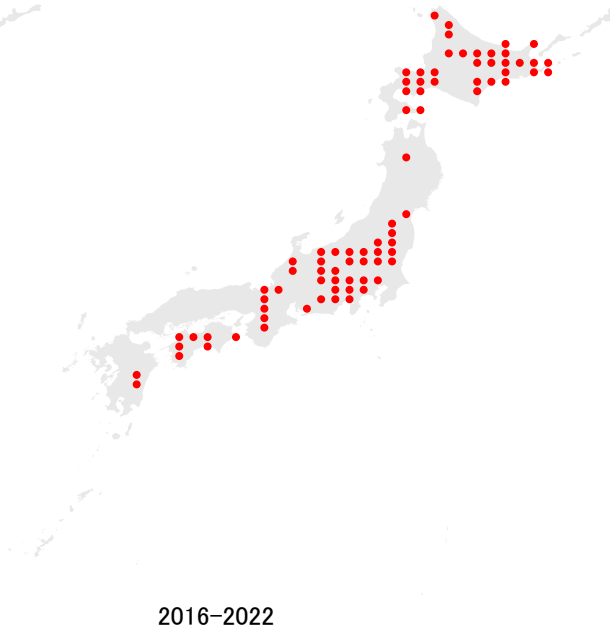


2016-2022

Eurasian Treecreeper *Certhia familiaris* Length: 14cm Weight: 7-9g

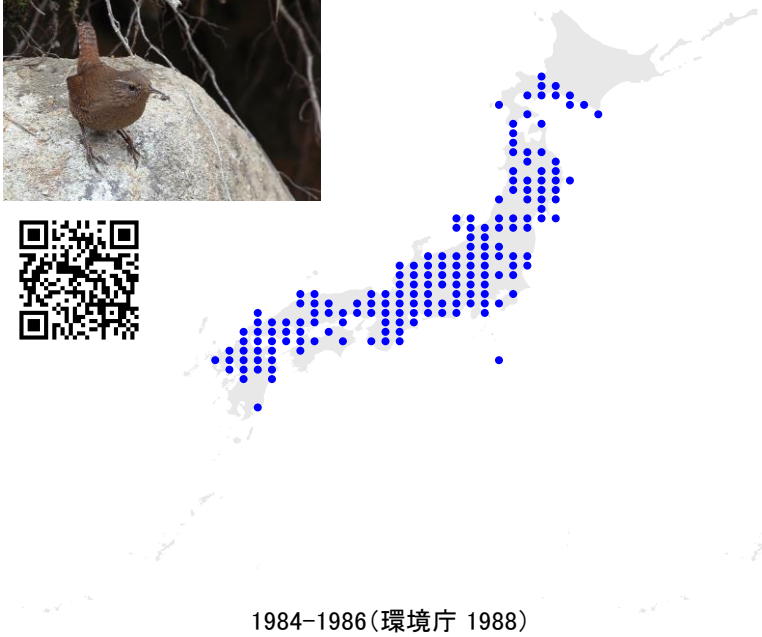


1984-1986（環境庁 1988）

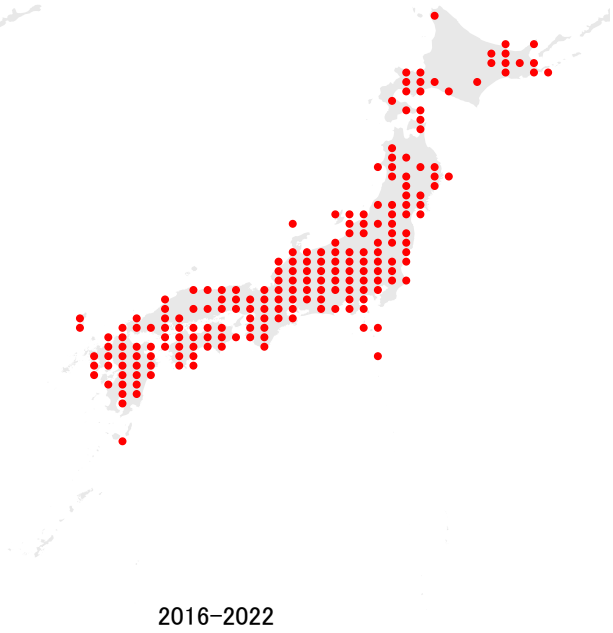


2016-2022

Eurasian Wren *Troglodytes troglodytes* Length: 9.9-10.9cm Weight: 6.8-10.9g

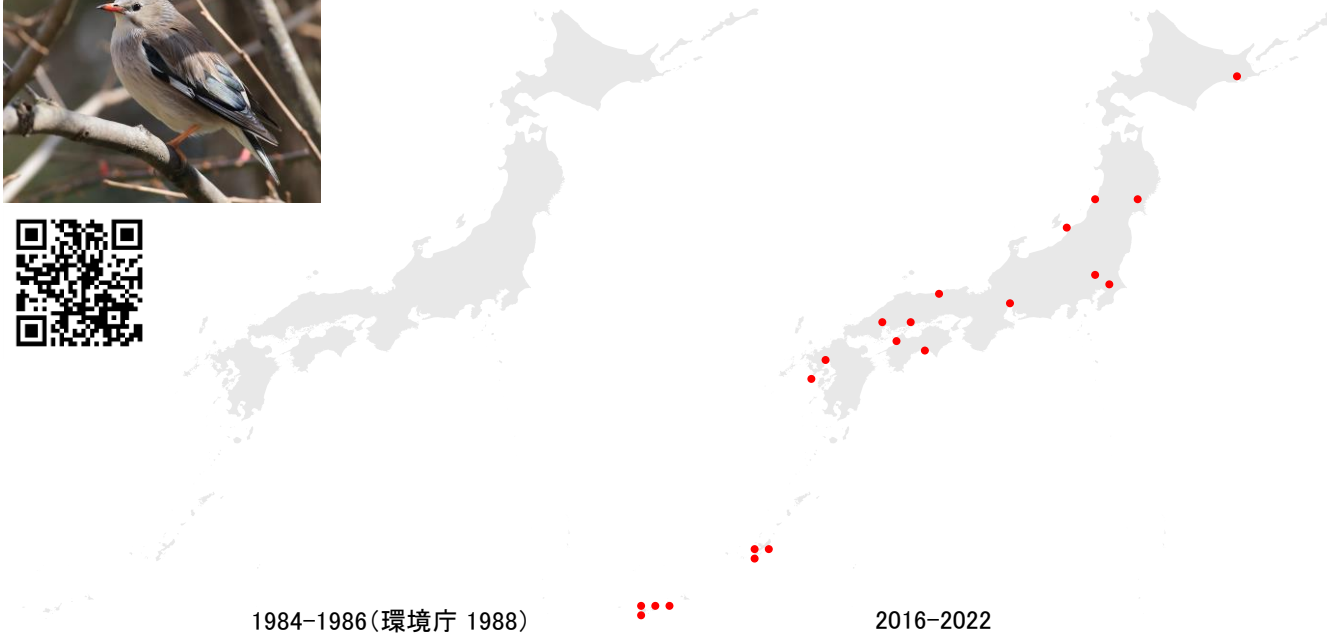


1984-1986（環境庁 1988）

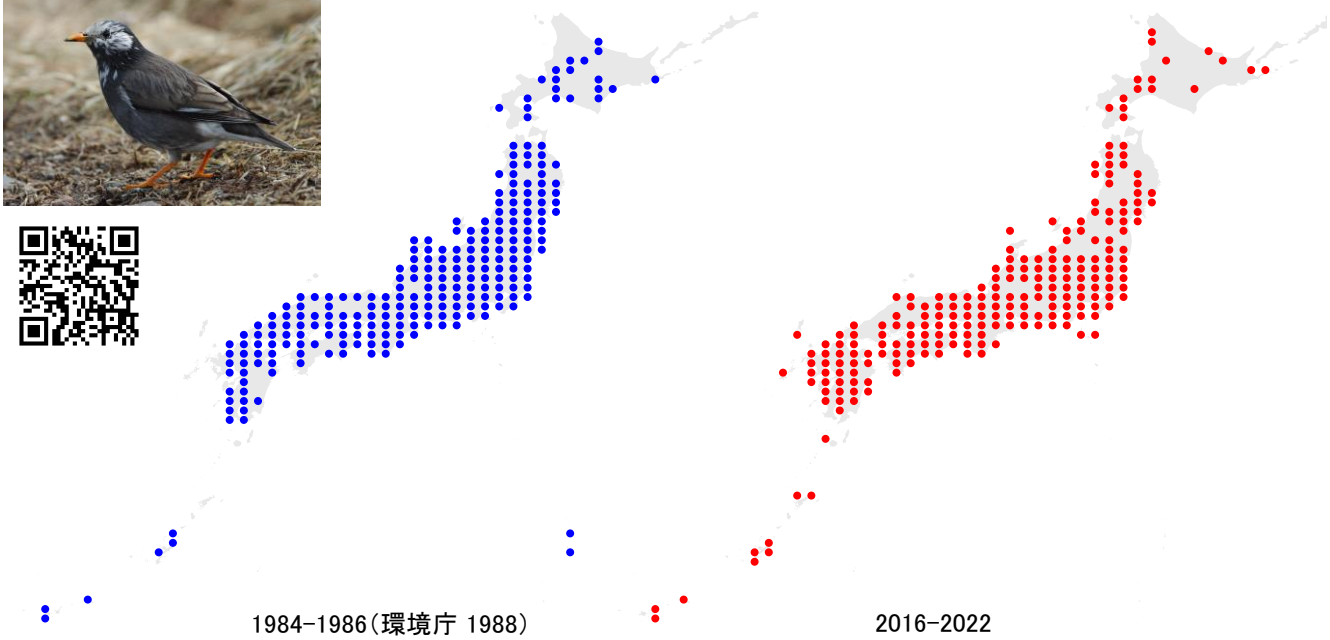


2016-2022

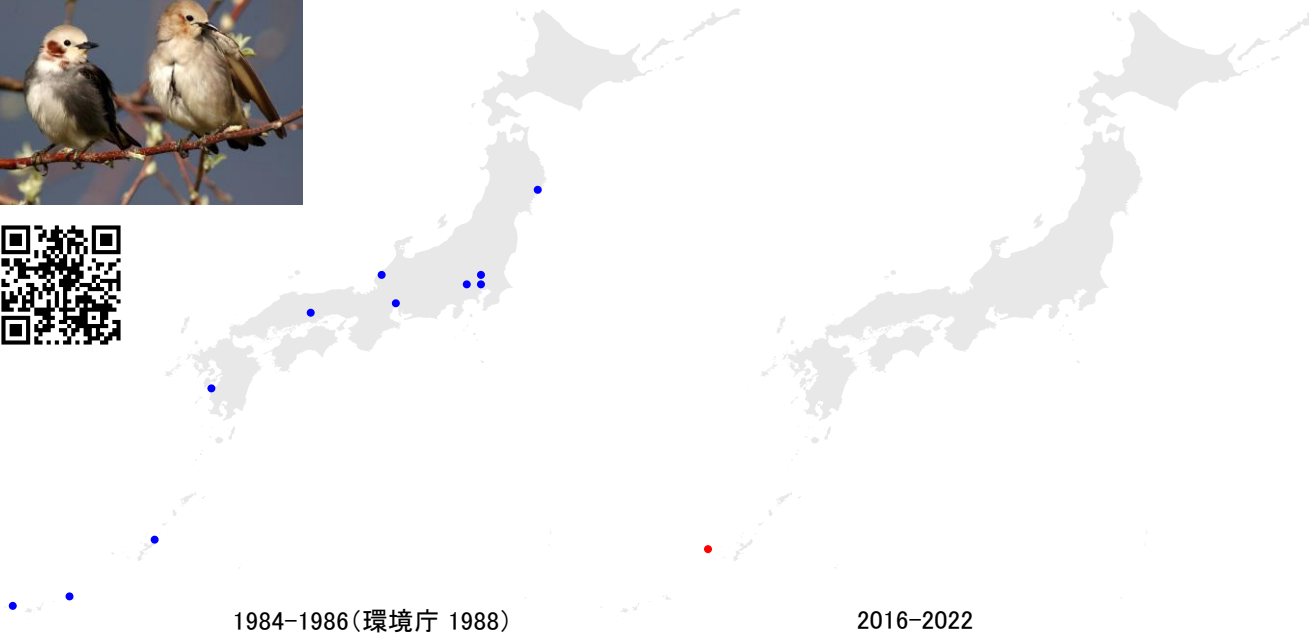
Red-billed Starling *Spodiopsar sericeus* Length: 22-24cm Weight: 65g



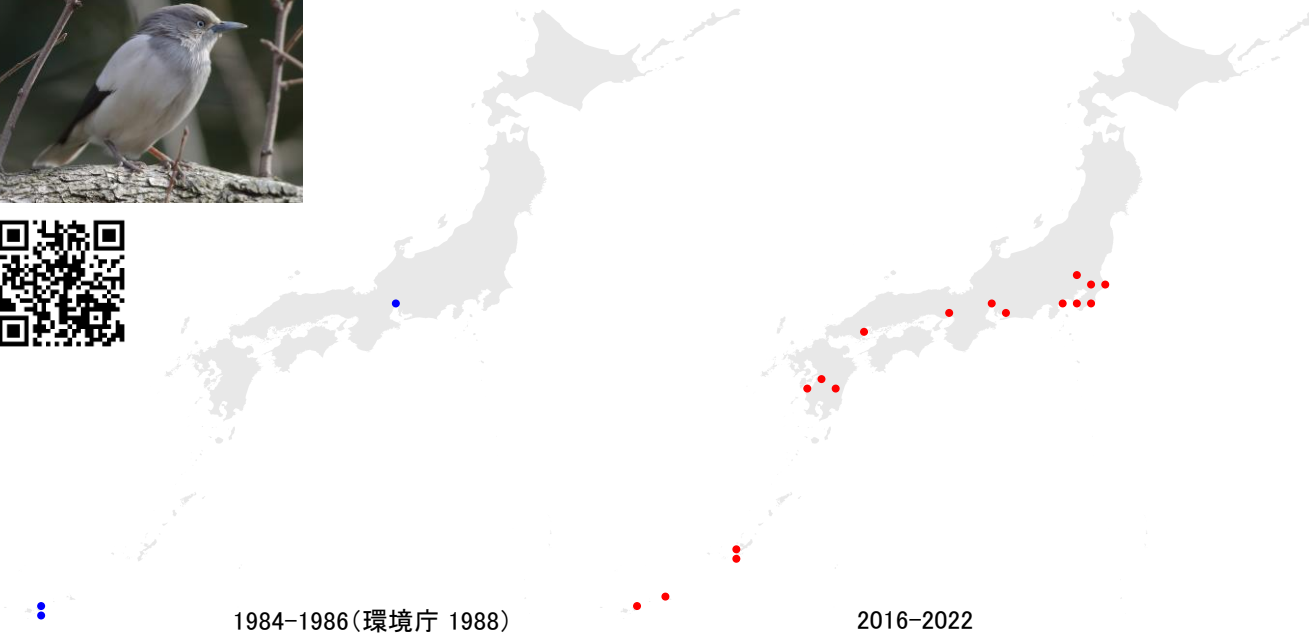
White-cheeked Starling *Spodiopsar cineraceus* Length: 22.5-24.3cm Weight: 67.5-97.5g



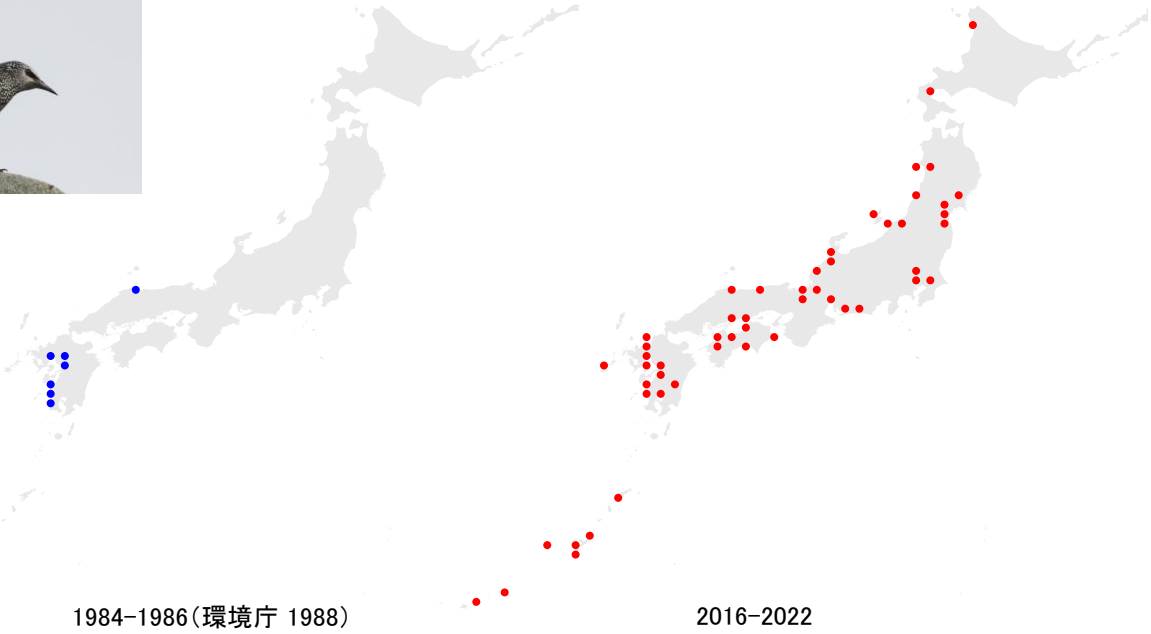
Chestnut-cheeked Starling *Agropsar philippensis* Length: 18.3-19.8cm Weight: ♂46.7±2.8g ♀47.2±3.9g



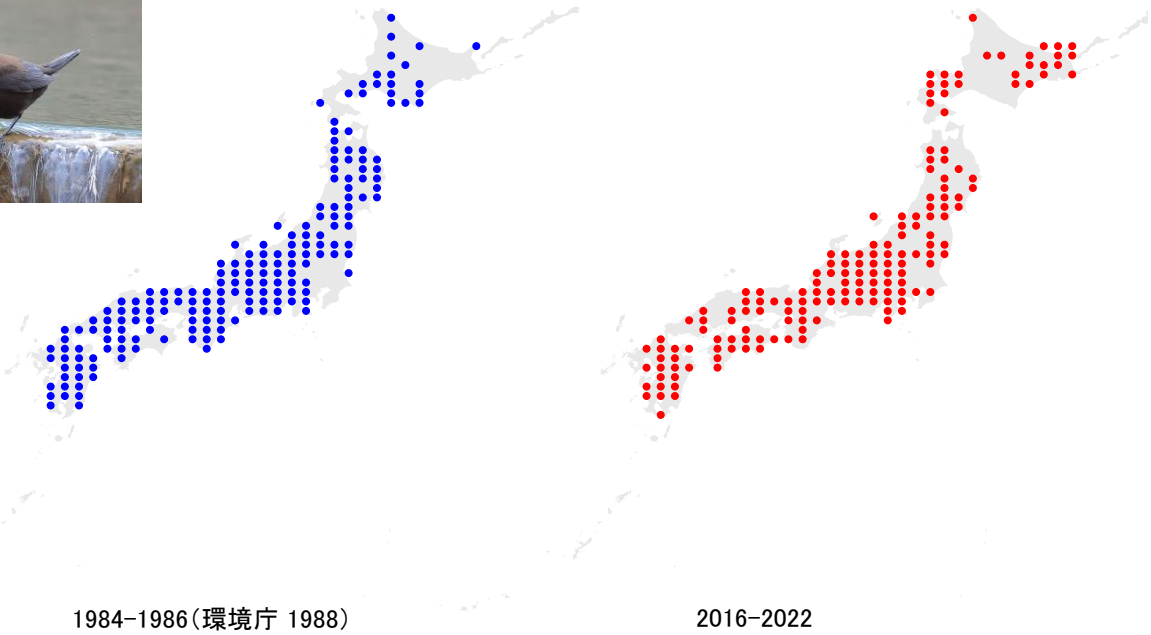
White-shouldered Starling *Sturnia sinensis* Length: 19-20cm Weight: 61g



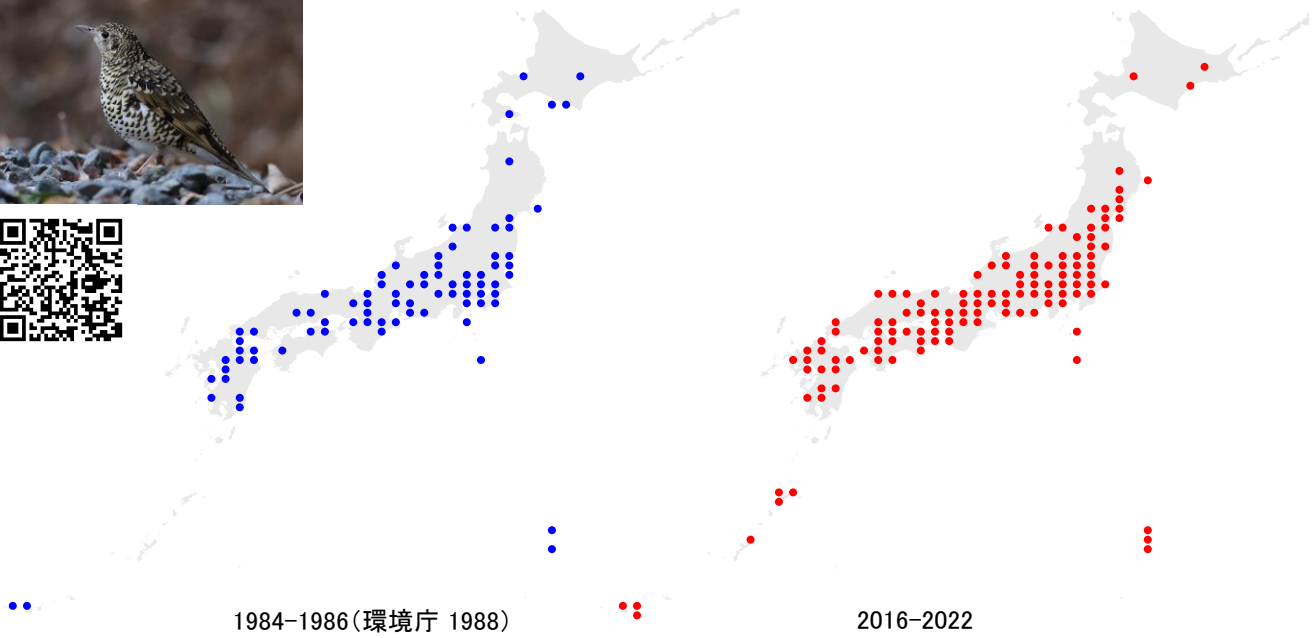
Common Starling *Sturnus vulgaris* Length: 22-24cm Weight: 55-100g



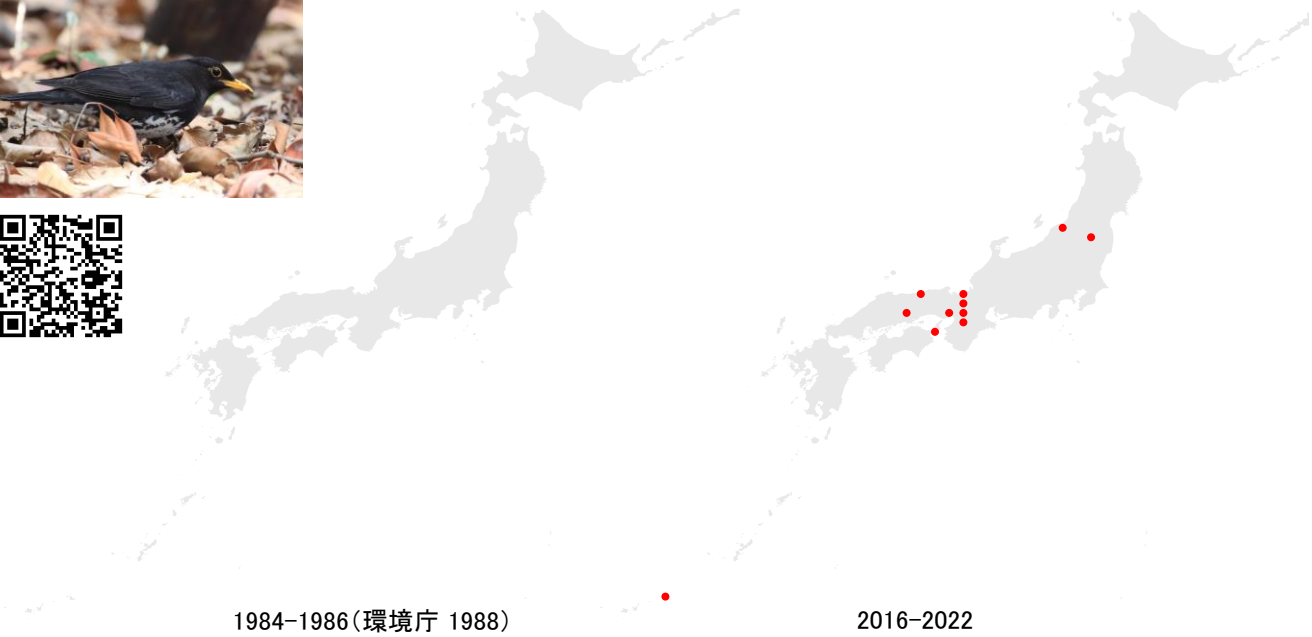
Brown Dipper *Cinclus pallasii* Length: 22cm Weight: 50-70g



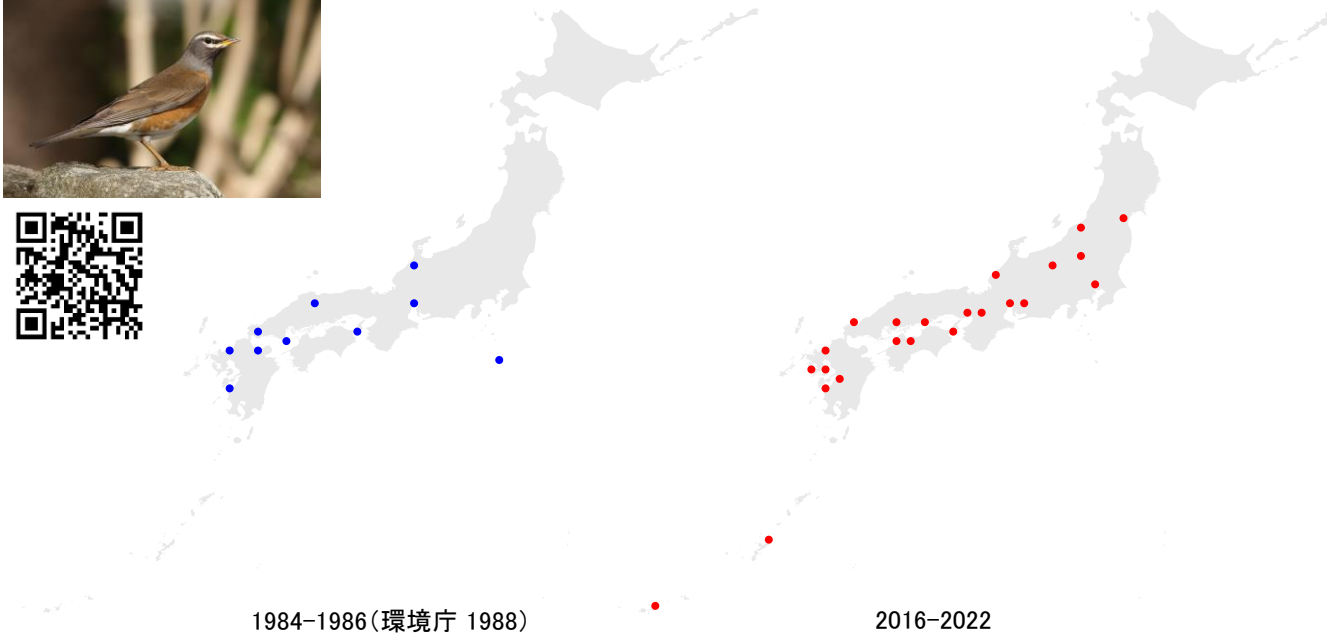
White's Thrush *Zoothera dauma* Length: 29.5cm Weight: 130g



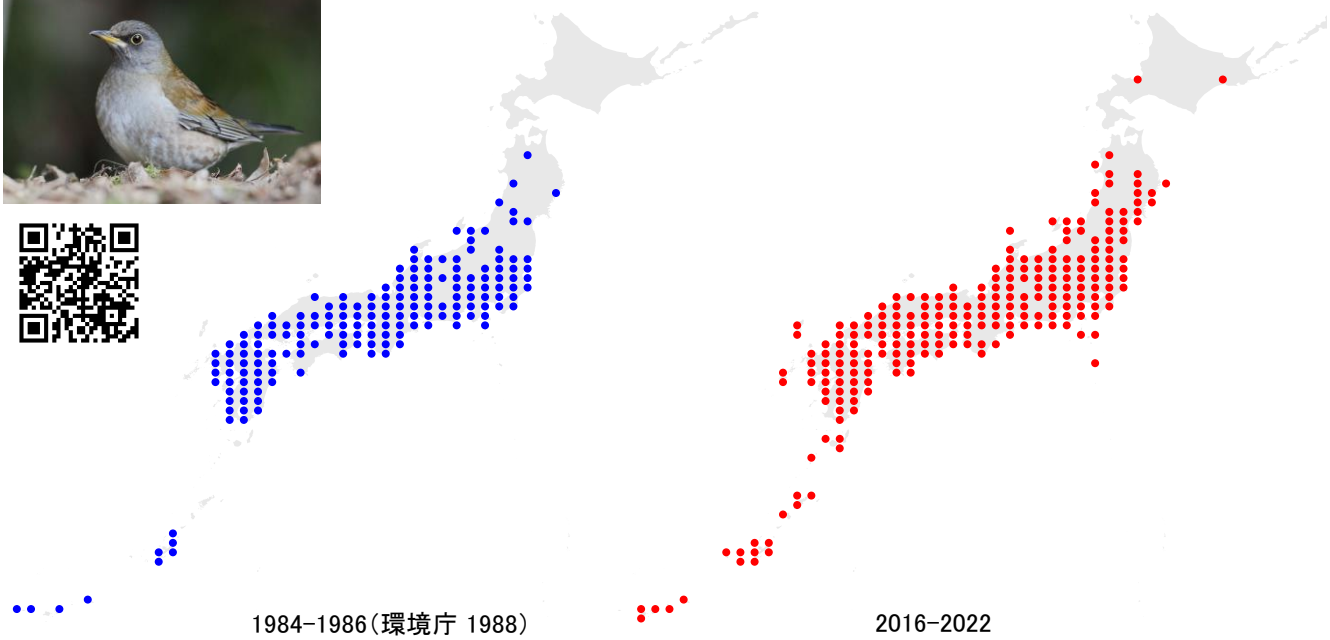
Japanese Thrush *Turdus cardis* Length: 21.0-22.5cm Weight: 50–65g



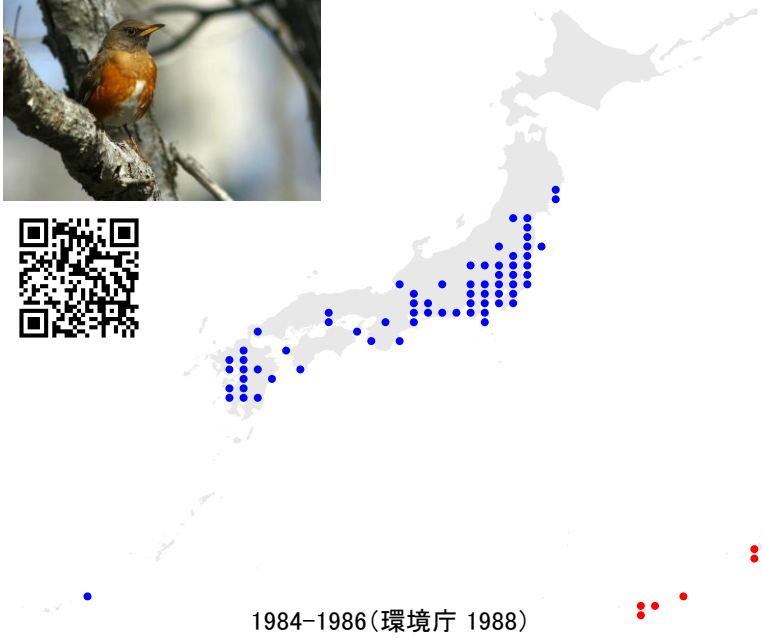
Eyebrowed Thrush *Turdus obscurus* Length: 22cm Weight: 58-73g



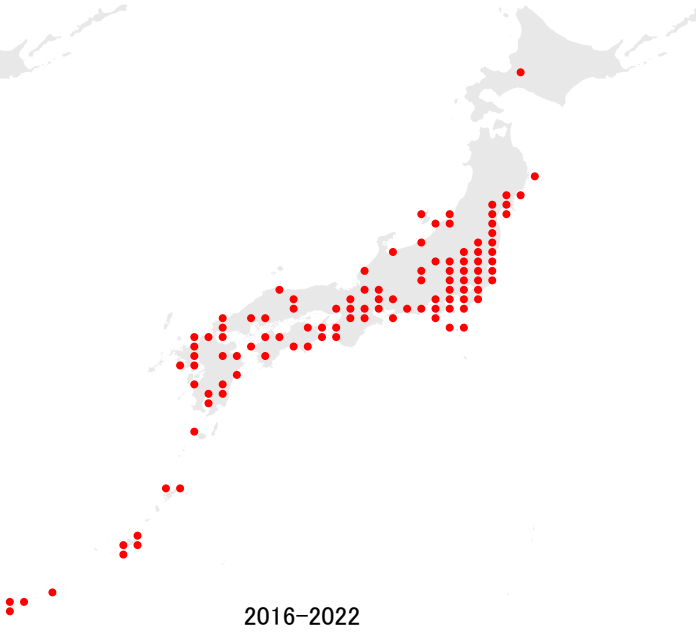
Pale Thrush *Turdus pallidus* Length: 24cm Weight: 66-80g



Brown-headed Thrush *Turdus chrysolaus* Length: 24cm Weight: 55-70g

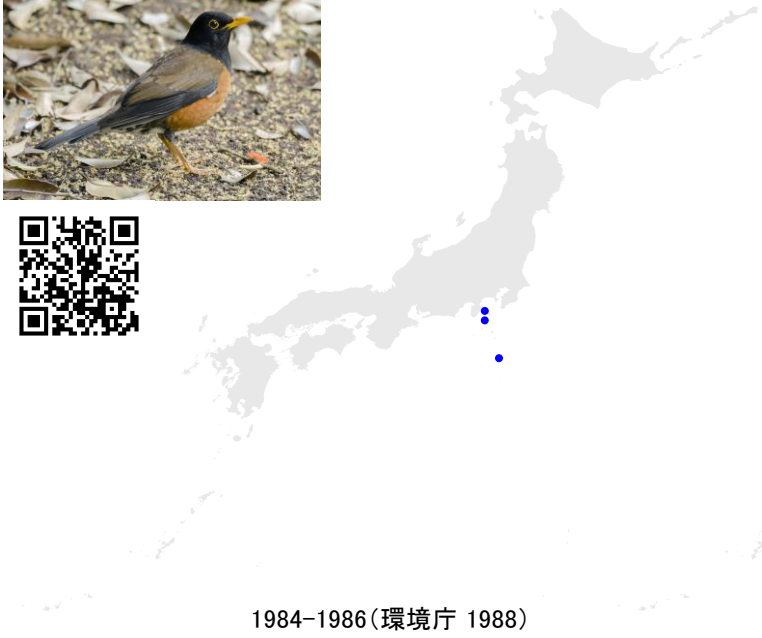


1984-1986（環境庁 1988）

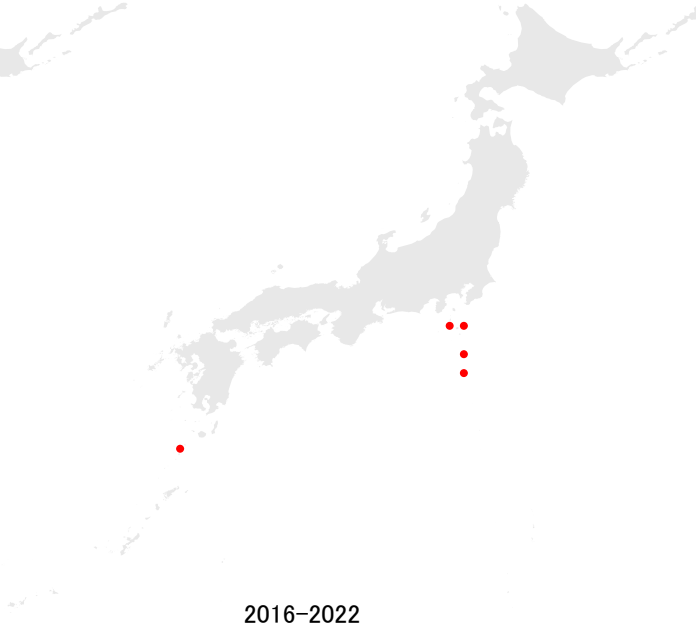


2016-2022

Izu Thrush *Turdus celaenops* Length: 23cm Weight: ♂73.7-81.3g ♀65.9-93.1g

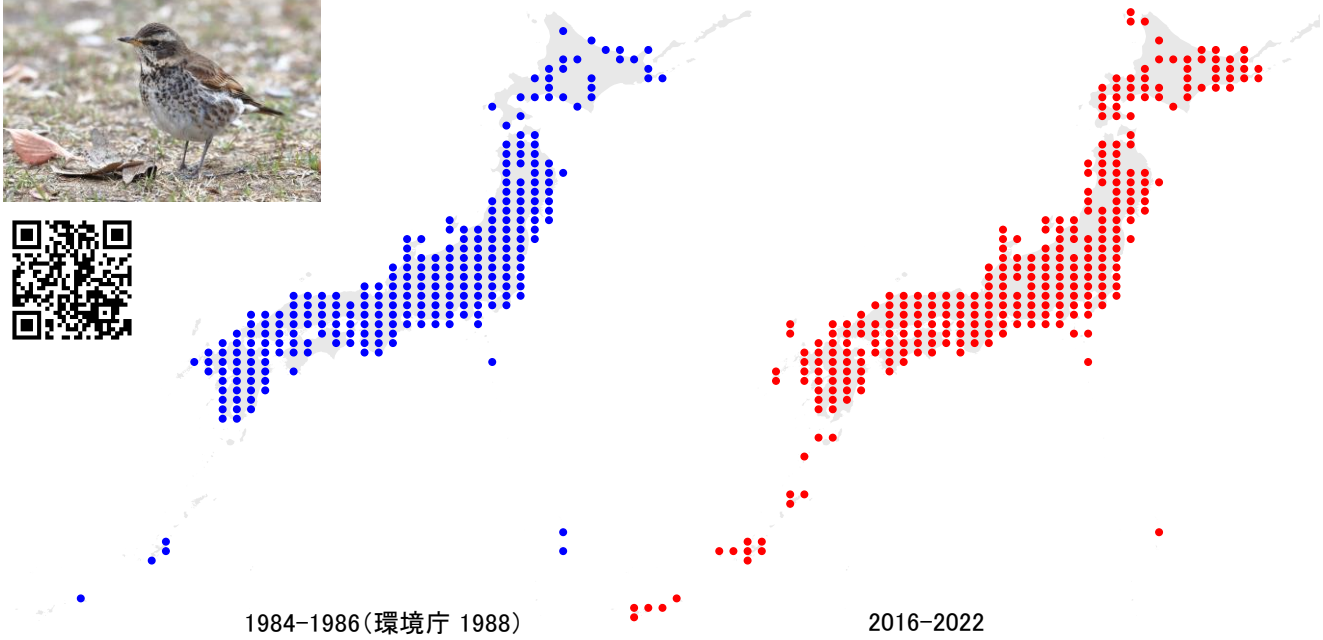


1984-1986（環境庁 1988）

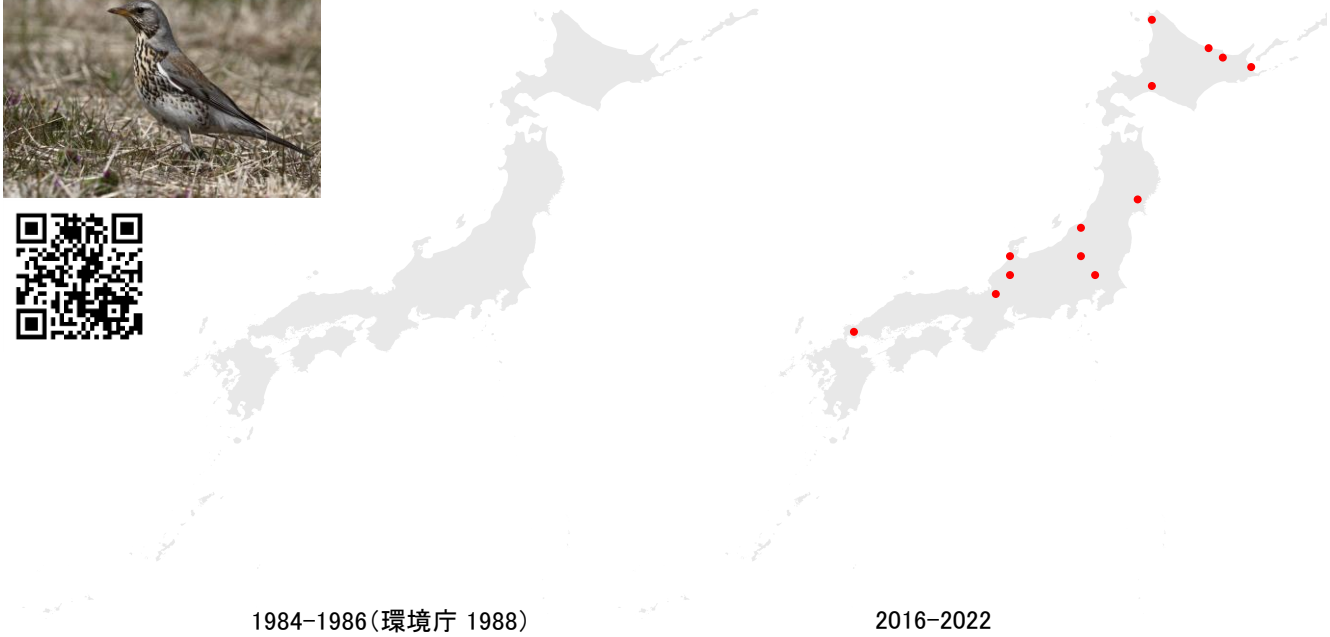


2016-2022

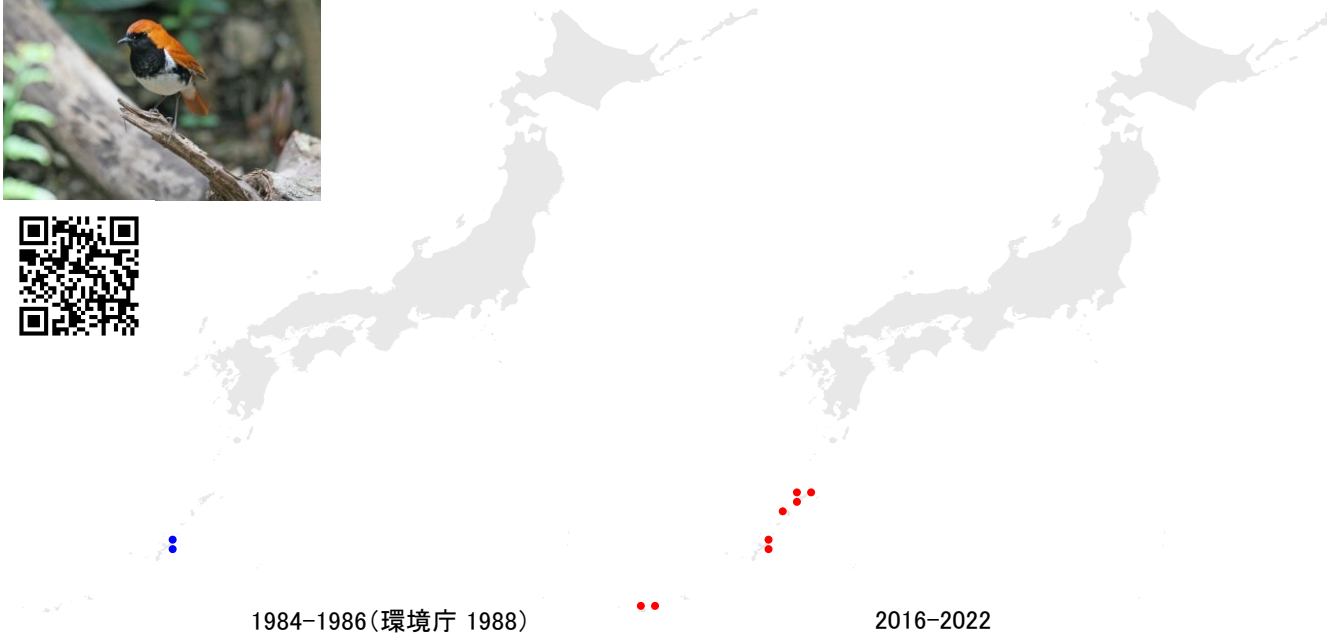
Dusky Thrush *Turdus naumanni* Length: 24cm Weight: 65-107g



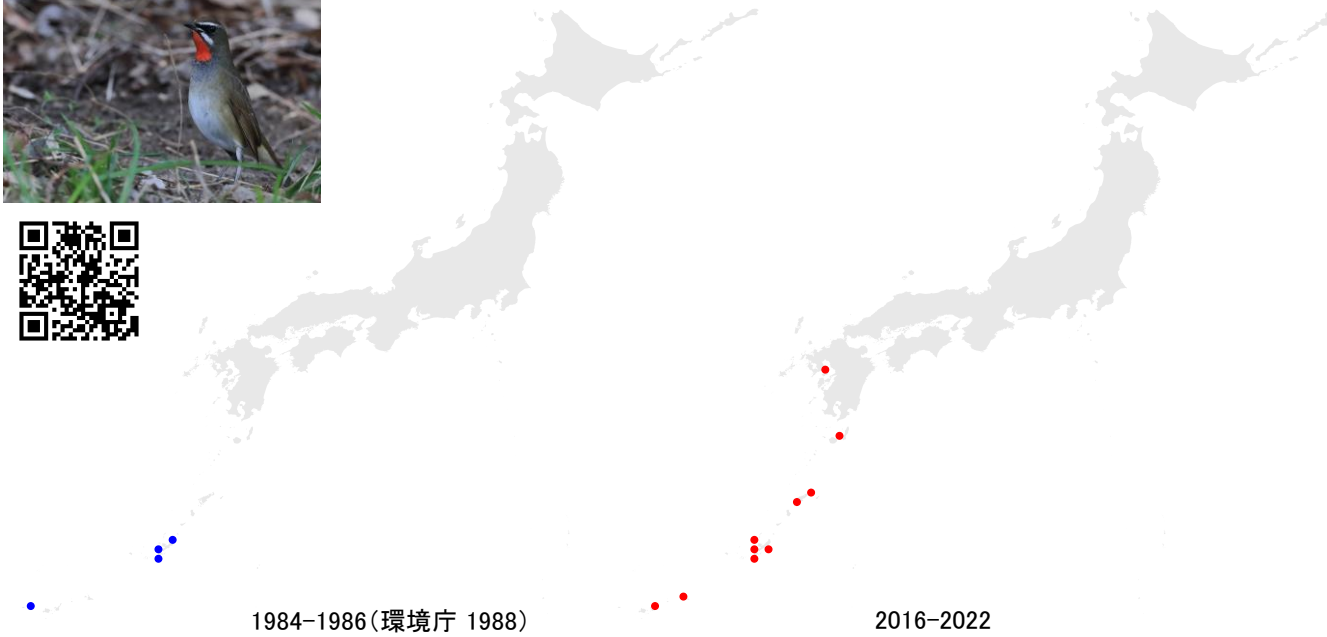
Fieldfare *Turdus pilaris* Length: 26cm Weight: 76-141g



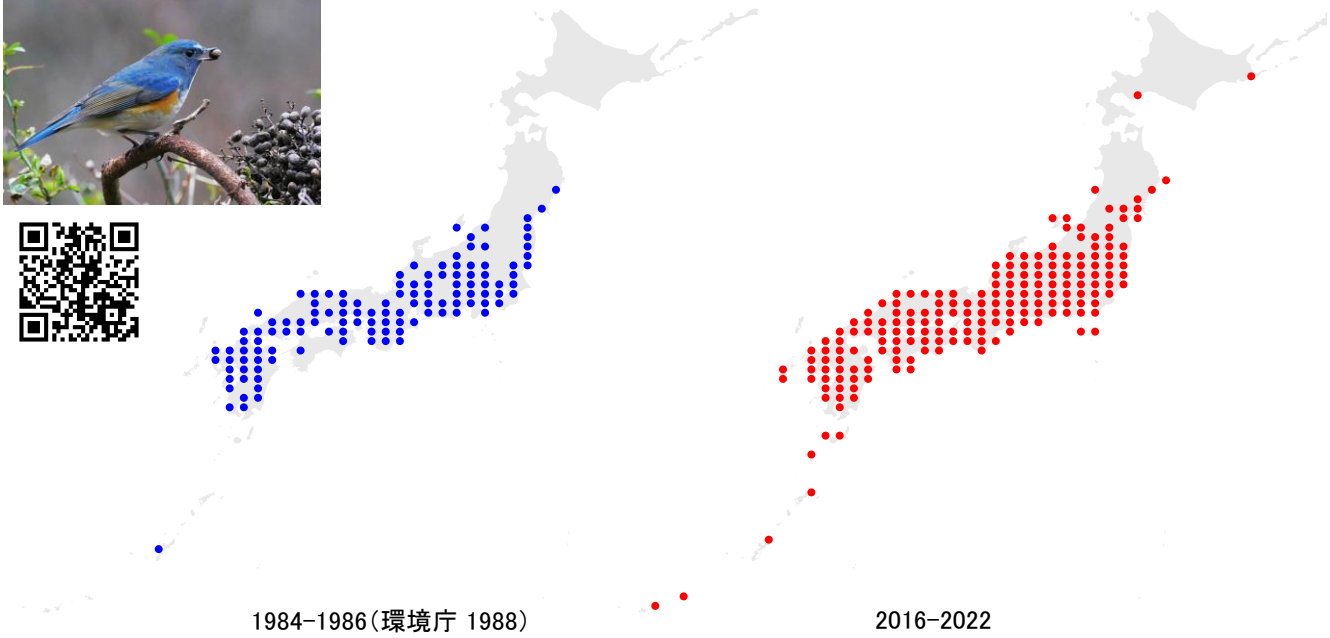
Ryukyu Robin *Luscinia komadori* Length: 14cm Weight: ♂23.0±1.3g ♀24.4±2.4g



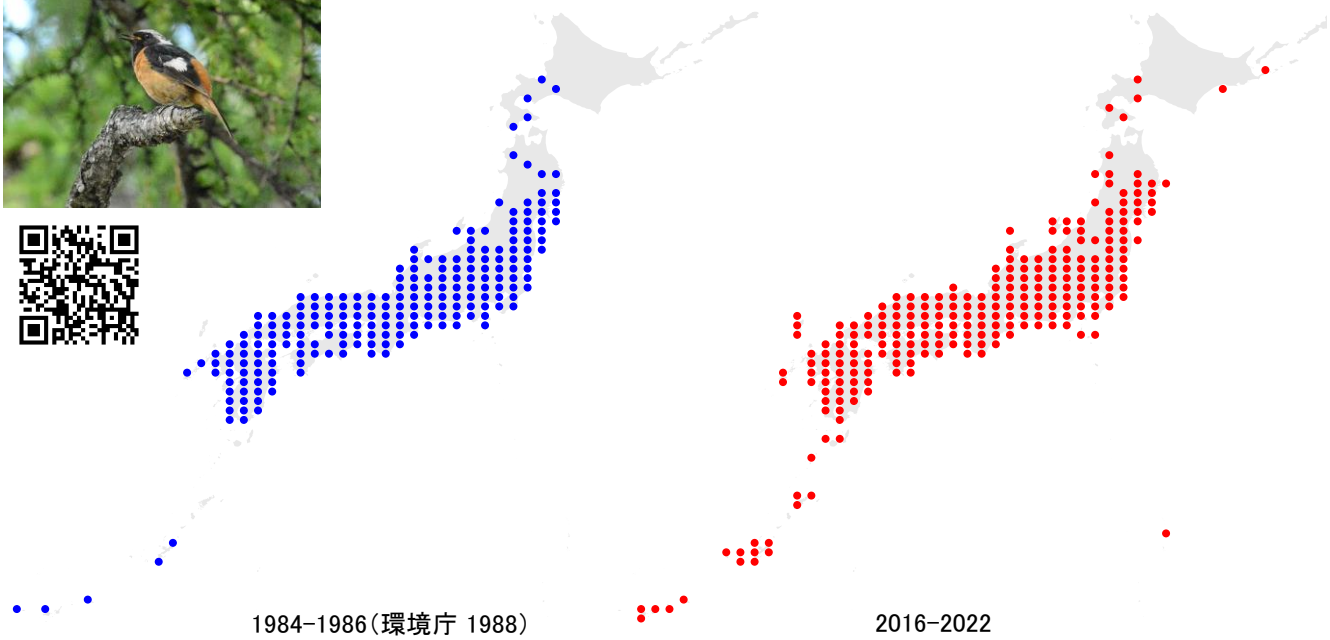
Siberian Rubythroat *Luscinia calliope* Length: 16cm Weight: 24-25g



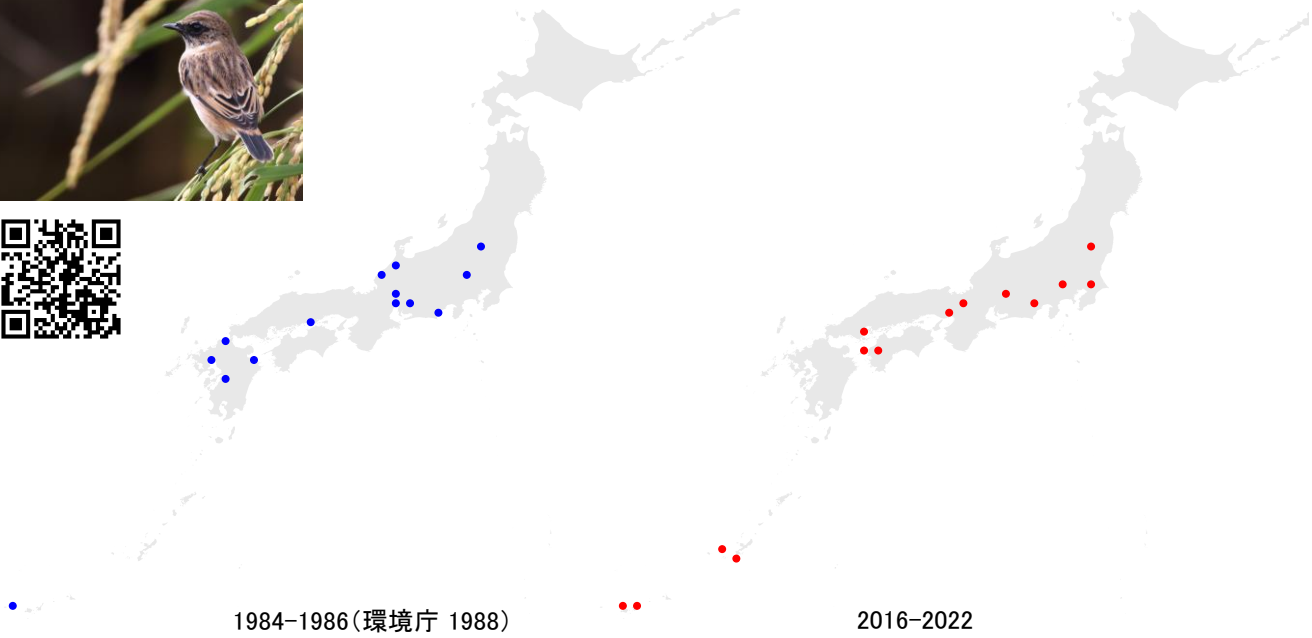
Red-flanked Bluetail *Tarsiger cyanurus* Length: 14cm Weight: ♂11.0-15.2g ♀10.0-17.8g



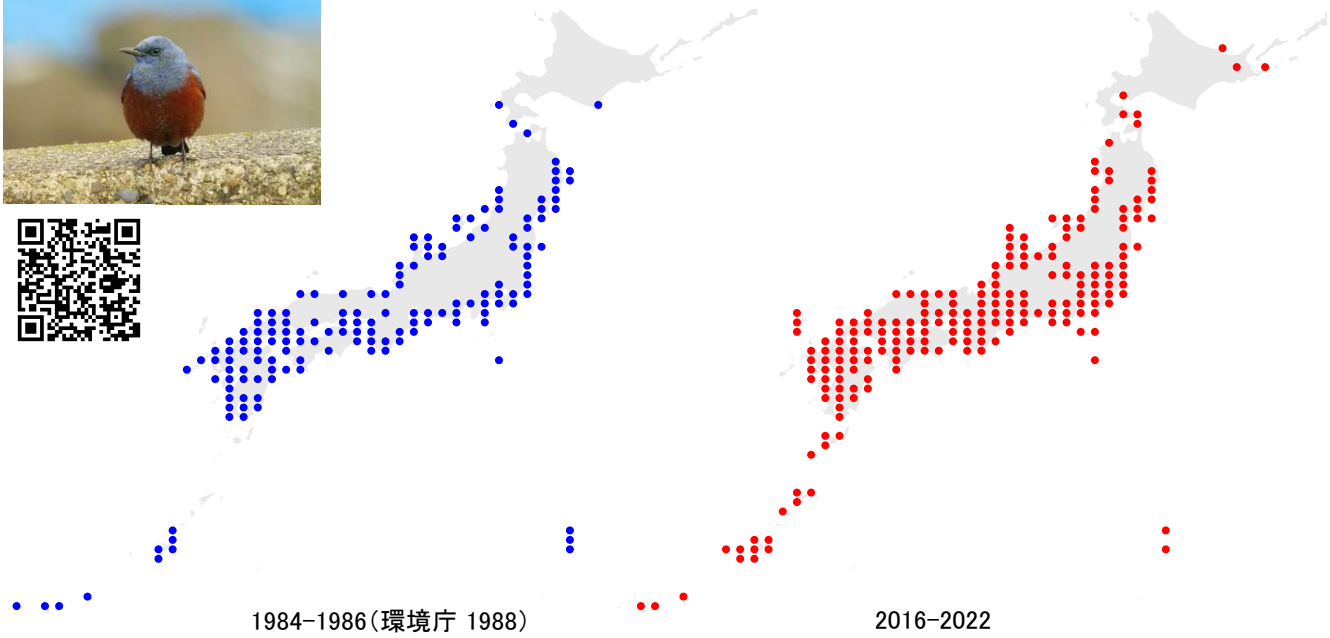
Daurian Redstart *Phoenicurus auroreus* Length: 14-15cm Weight: 11-20g



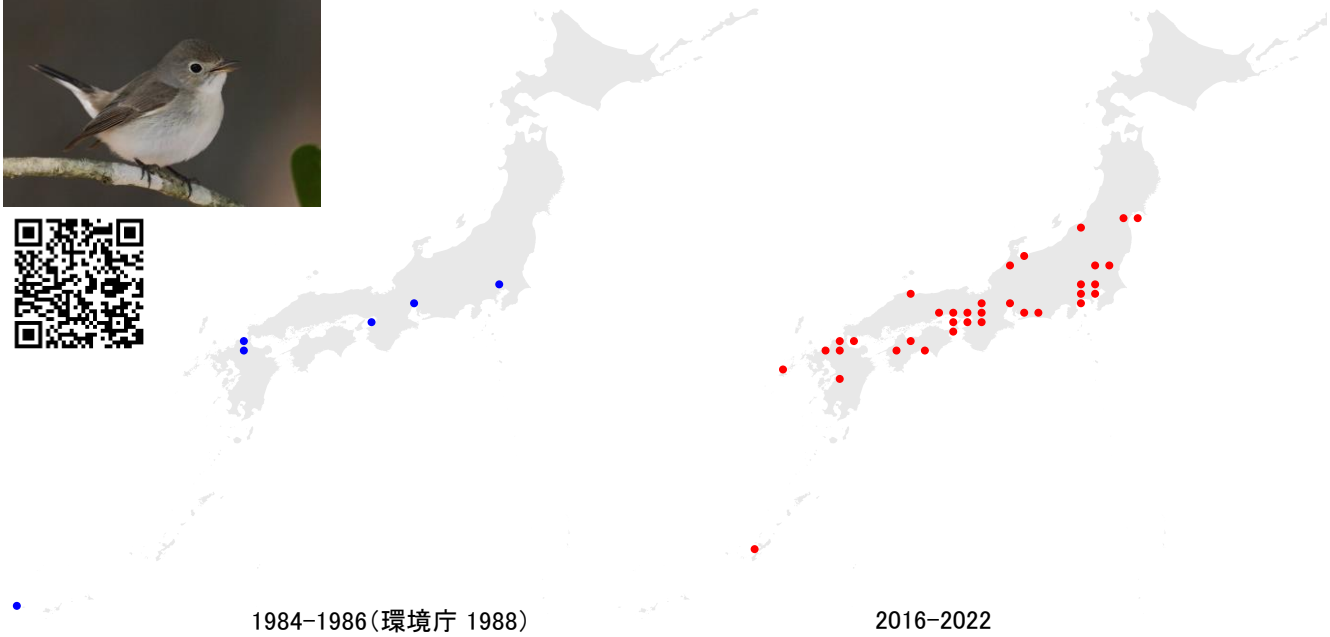
Stejneger's Stonechat *Saxicola torquatus* Length: 13cm Weight: 12-16g



Blue Rock Thrush *Monticola solitarius* Length: ♂22.5cm ♀22.1cm Weight: ♂62.0g ♀57.3g

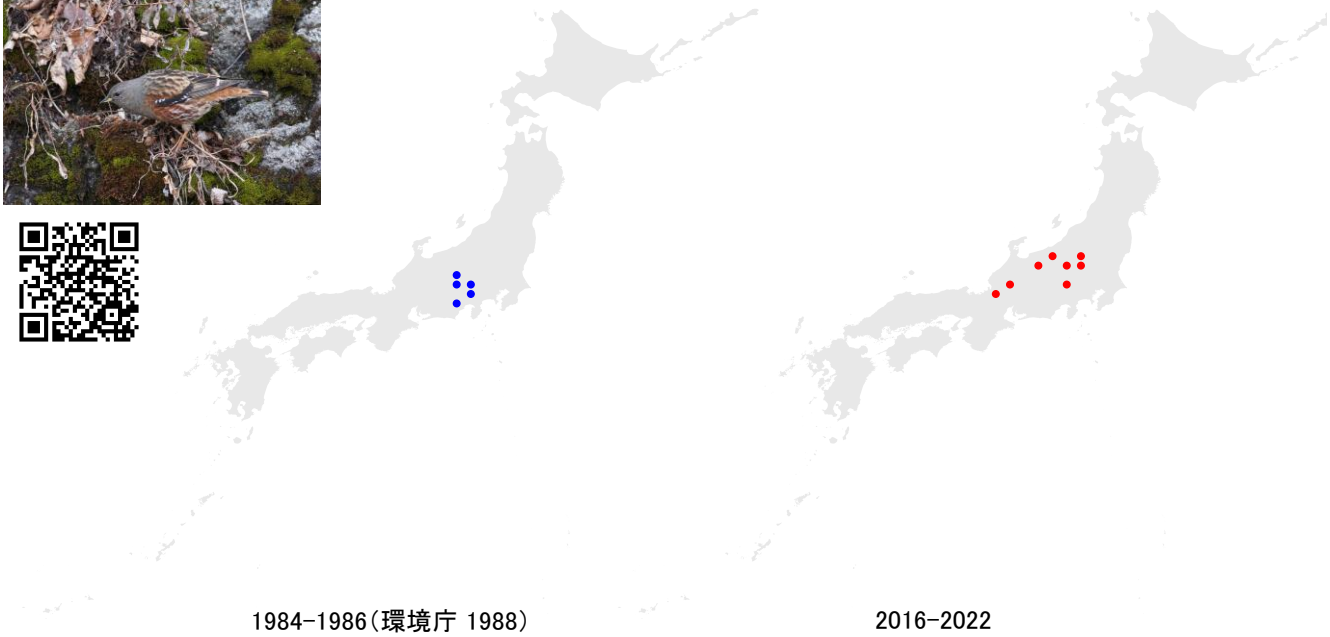


Taiga/Red-breasted Flycatcher *Ficedula albicilla/parva* Length: 12cm Weight: 10-14g



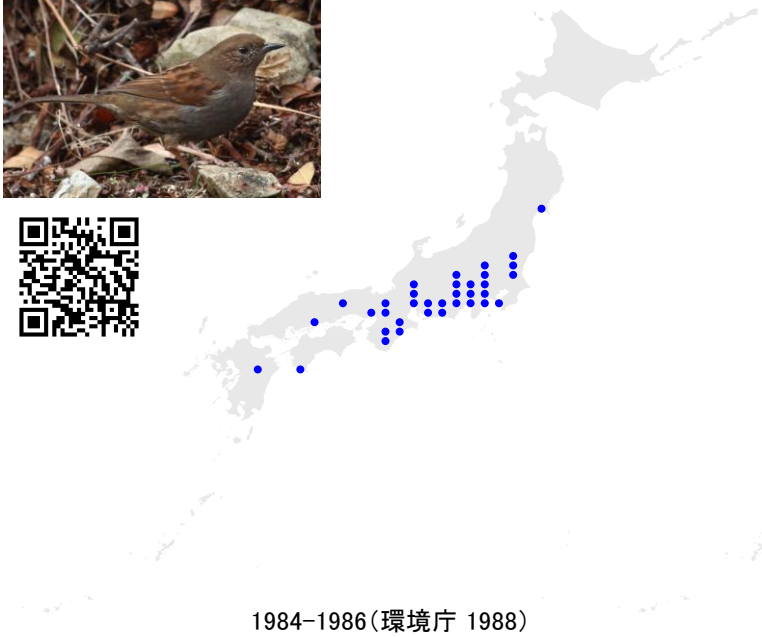
1984-1986(環境庁 1988) 2016-2022

Alpine Accentor *Prunella collaris* Length: 18cm Weight: 33-43g

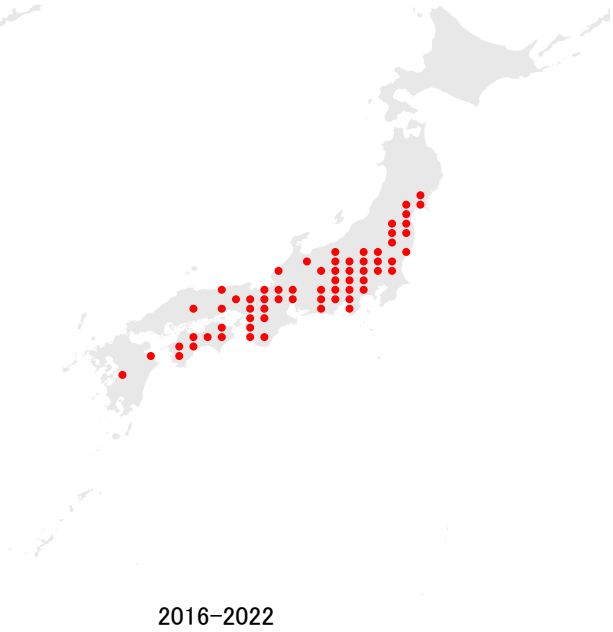


1984-1986(環境庁 1988) 2016-2022

Japanese Accentor *Prunella rubida* Length: 14cm Weight: 15-23g

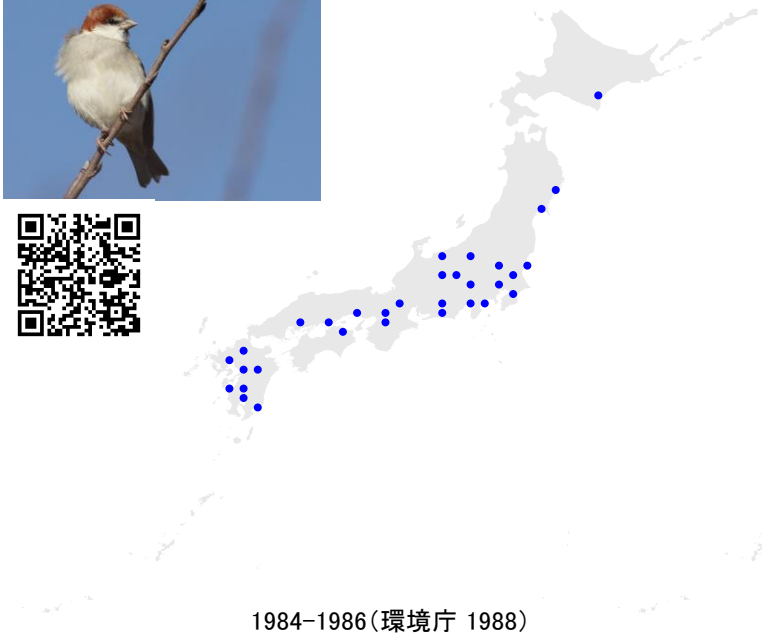


1984-1986(環境庁 1988)

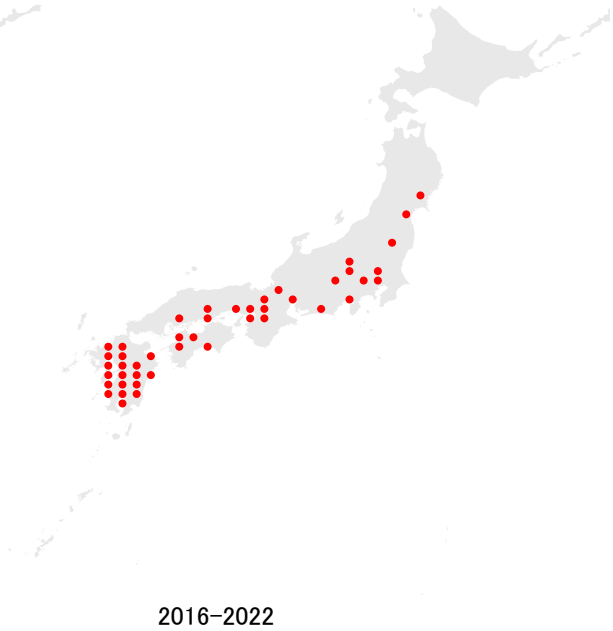


2016-2022

Russet Sparrow *Passer rutilans* Length: 14cm Weight: 20g

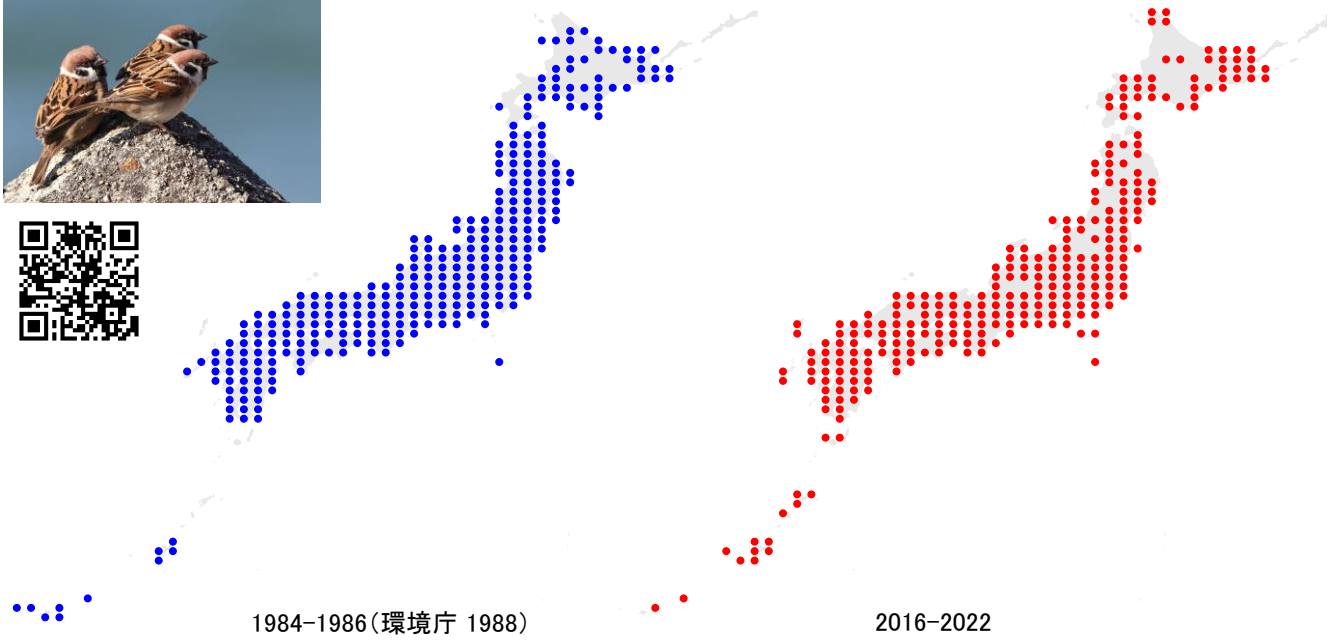


1984-1986(環境庁 1988)

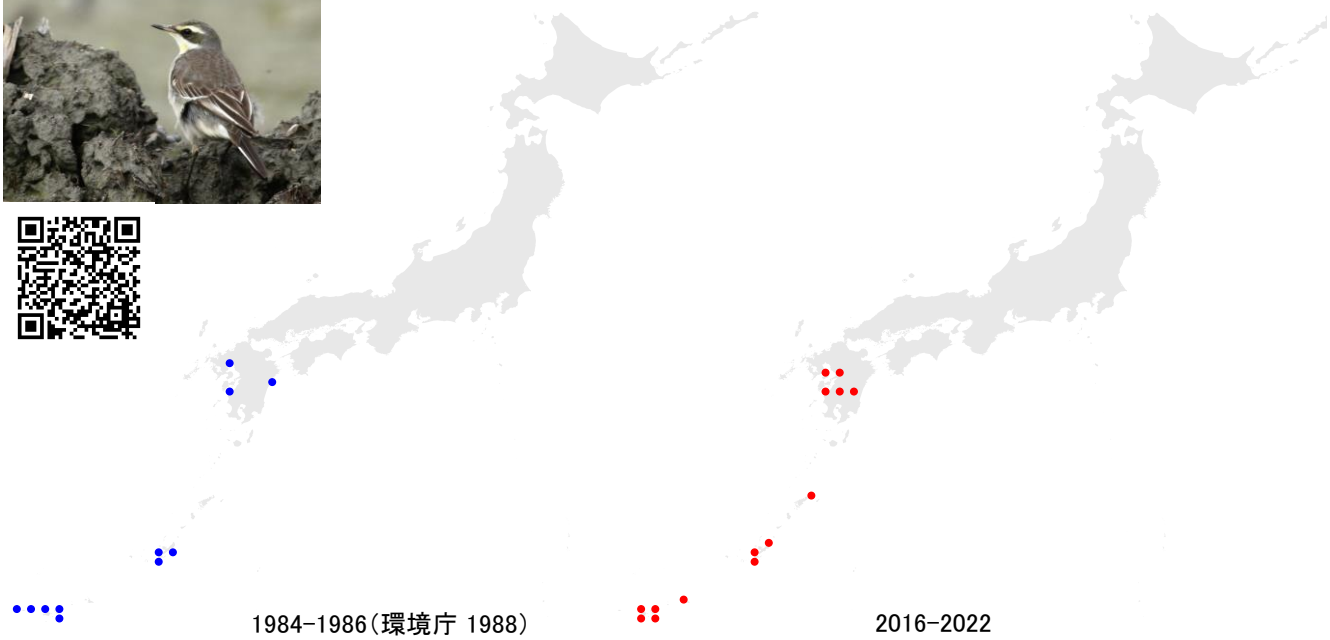


2016-2022

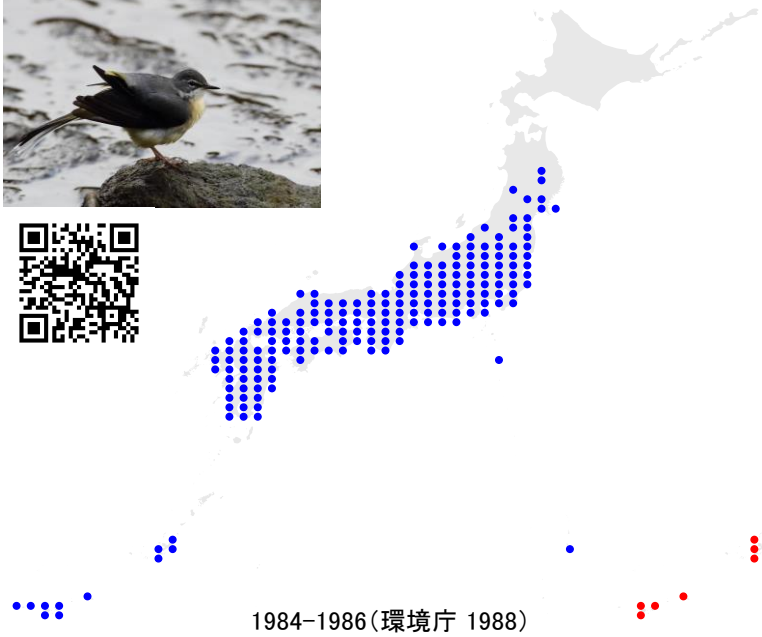
Eurasian Tree Sparrow *Passer montanus* Length: 14-15cm Weight: 24g

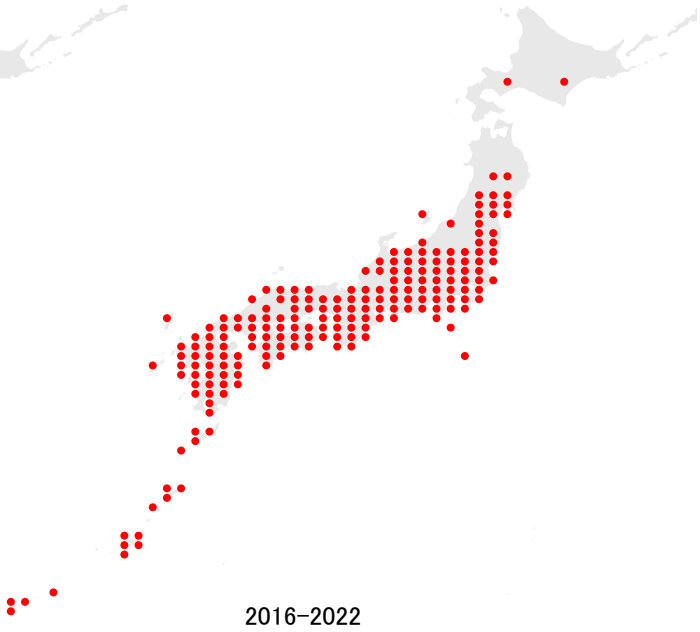


Eastern Yellow Wagtail *Motacilla flava* Length: 16.5cm Weight: 18g

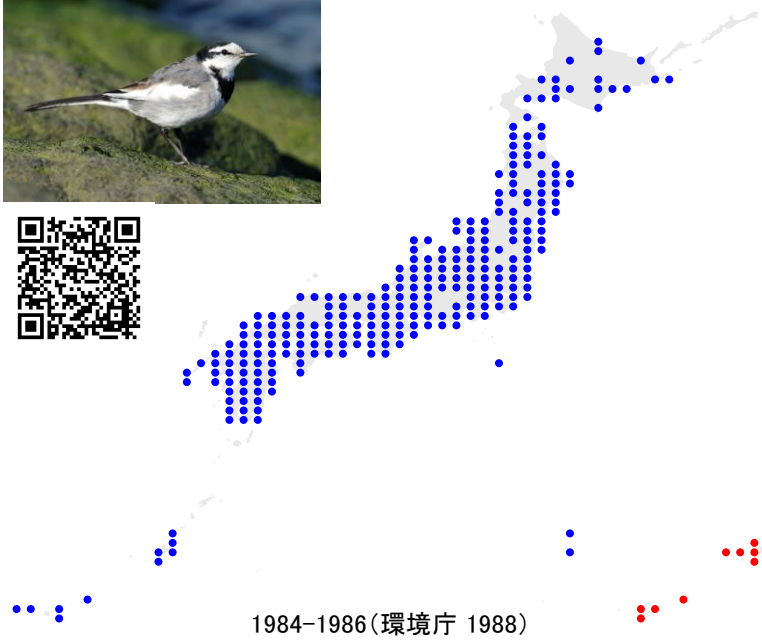


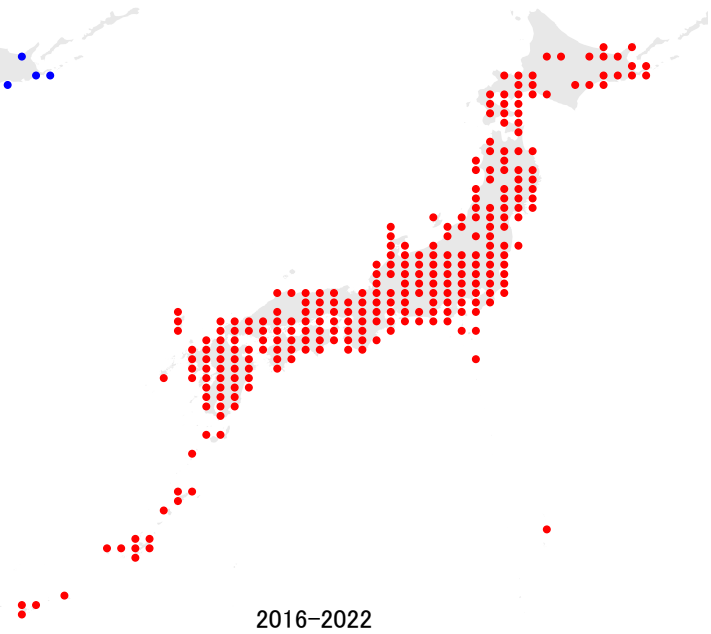
Grey Wagtail *Motacilla cinerea* Length: 19cm Weight: 17g





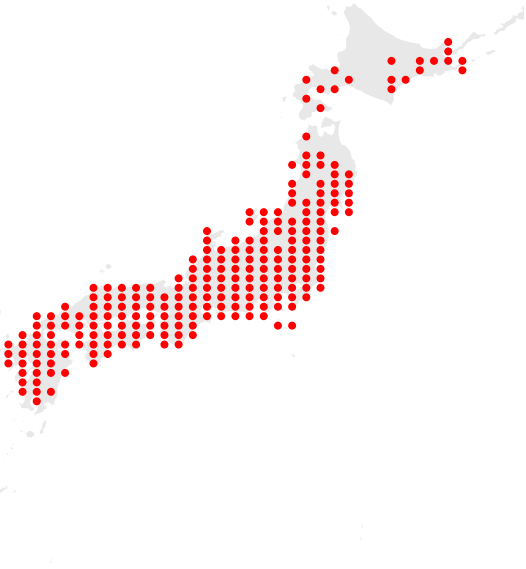
White Wagtail *Motacilla alba* Length: 19.7-21.4cm Weight: 25.5-34.5g





Japanese Wagtail *Motacilla grandis* Length: 21cm Weight: ♂31.2±2.3g ♀28.0±1.5g

1984-1986(環境庁 1988)



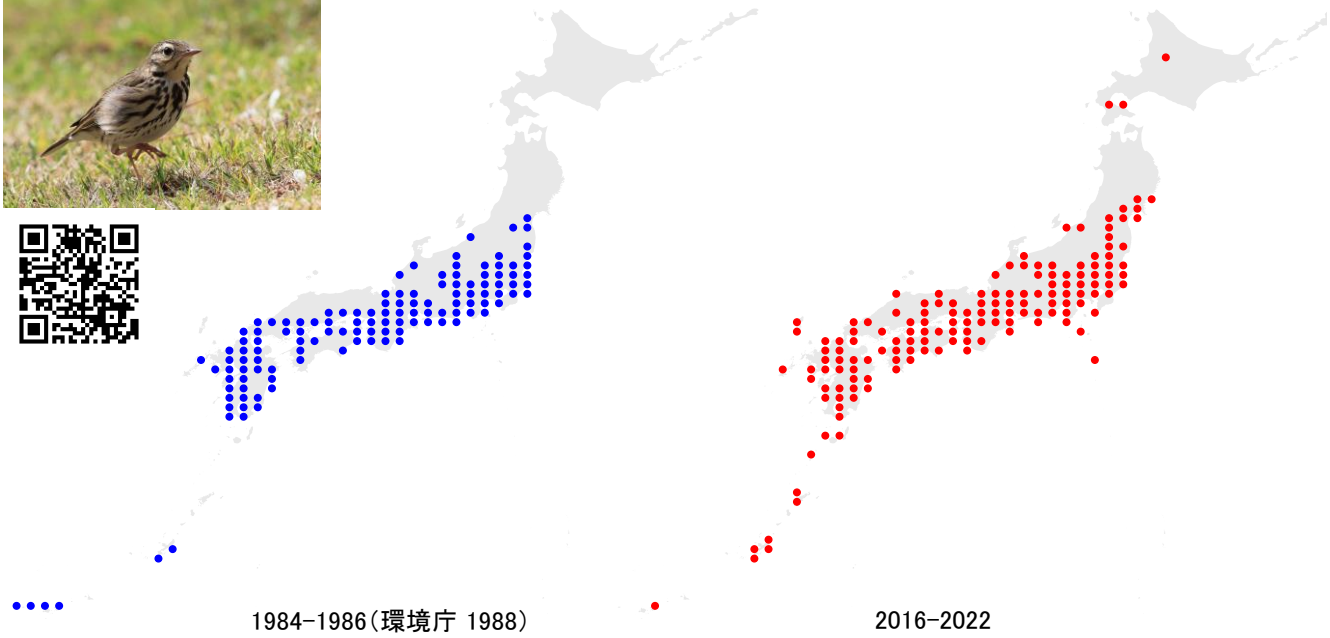
2016-2022

Richard's Pipit *Anthus richardi* Length: 18cm Weight: 30g

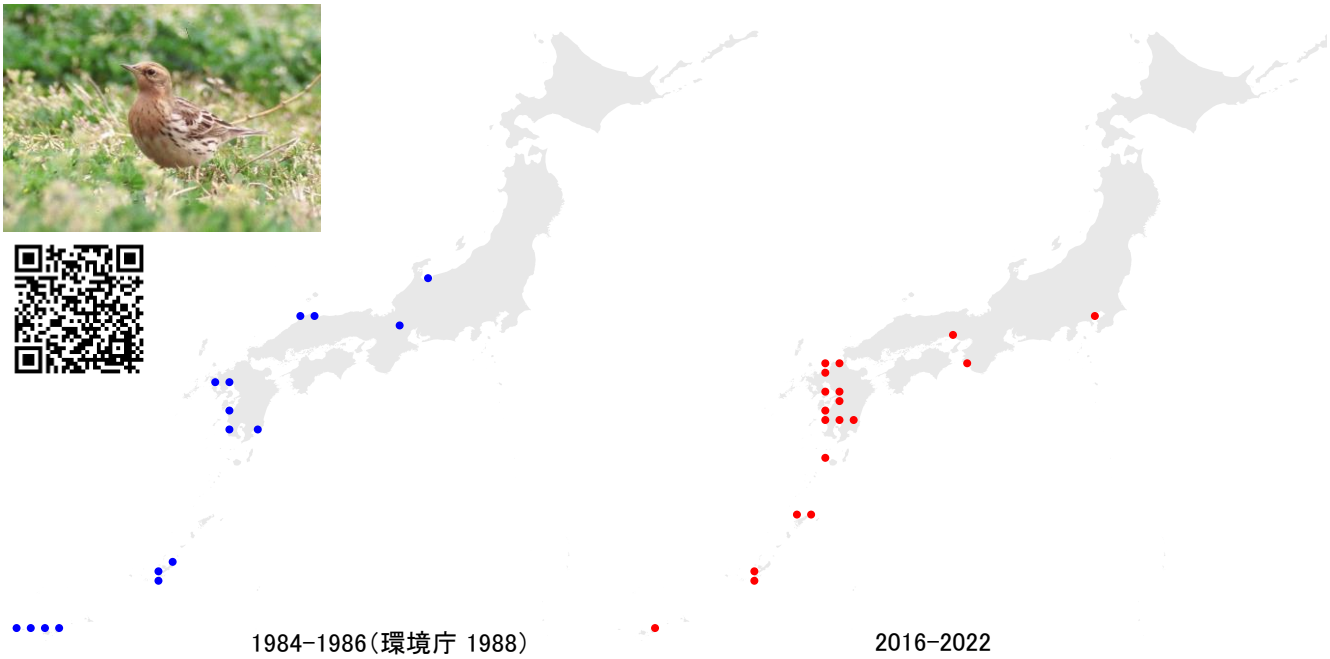
1984-1986(環境庁 1988)

2016-2022

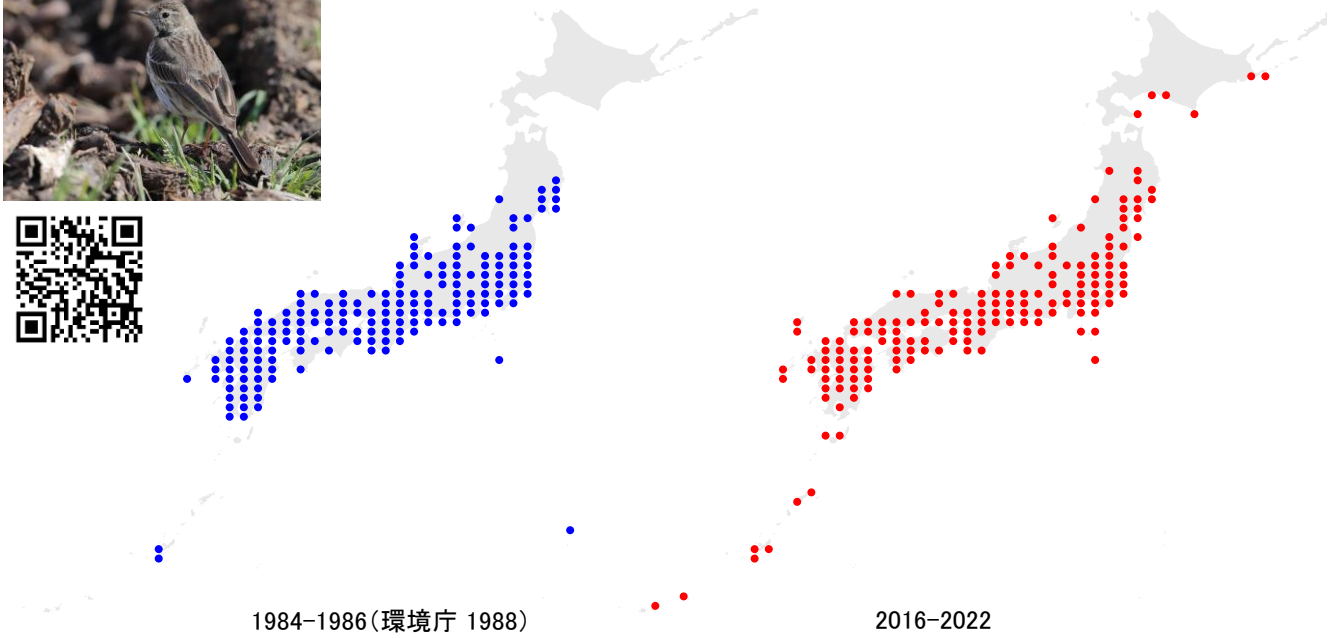
Olive-backed Pipit *Anthus hodgsoni* Length: 15cm Weight: 21g



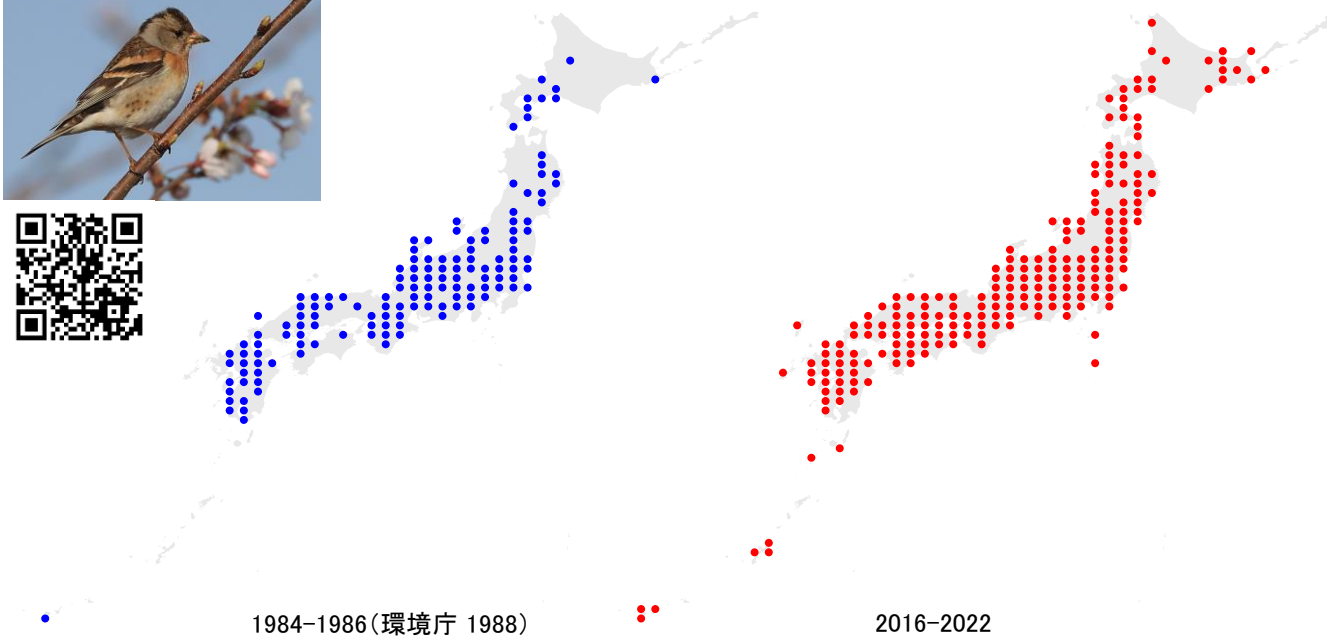
Red-throated Pipit *Anthus cervinus* Length: 15cm Weight: 19-21g



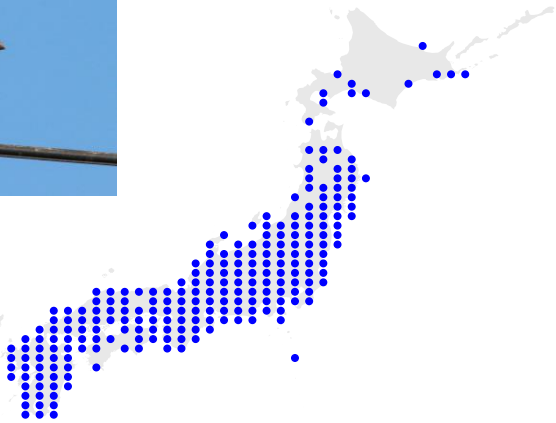
Buff-bellied Pipit *Anthus rubescens* Length: 17cm Weight: 25g



Brambling *Fringilla montifringilla* Length: 16cm Weight: 17-26g



Grey-capped Greenfinch *Chloris sinica* Length: 13-17cm Weight: 17-30g



1984-1986（環境庁 1988）

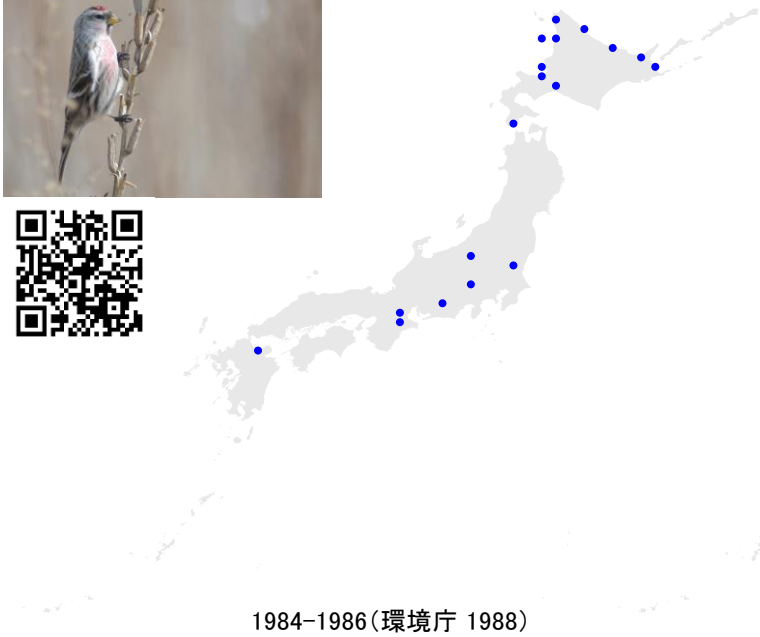
2016-2022

Eurasian Siskin *Carduelis spinus* Length: 13cm Weight: 9-17g

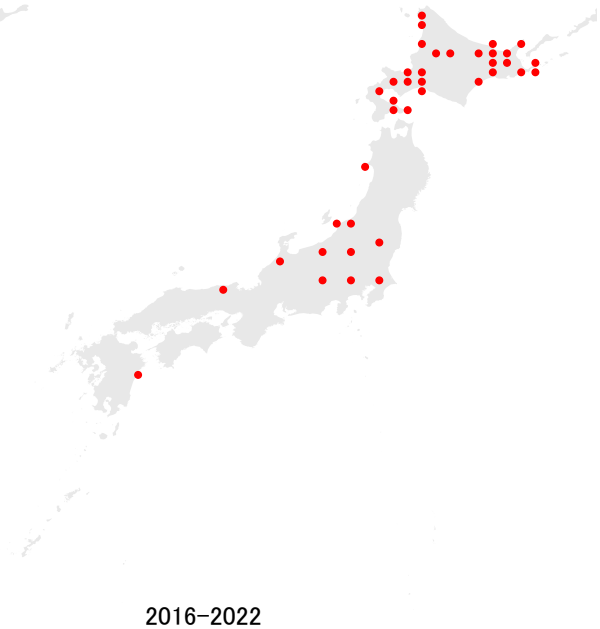
1984-1986（環境庁 1988）

2016-2022

Common Redpoll *Carduelis flammea* Length: 14cm Weight: 12-15g

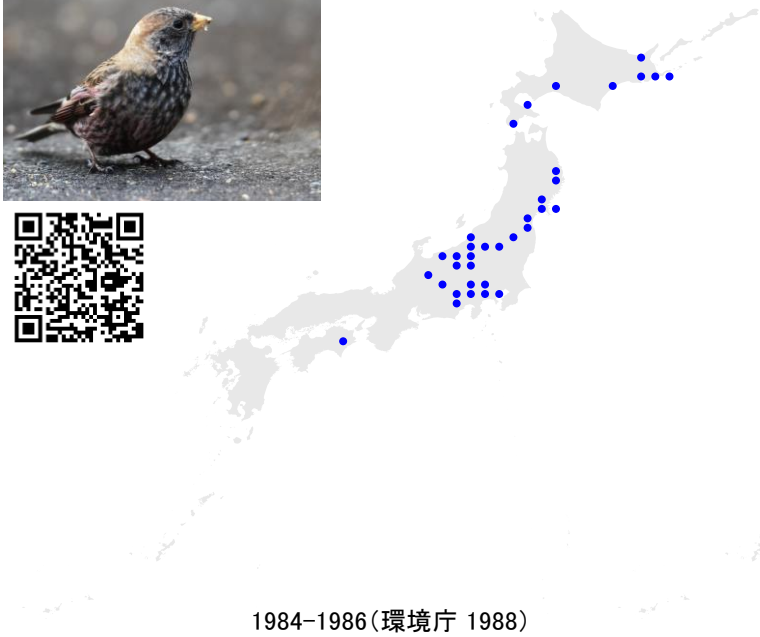


1984-1986（環境庁 1988）

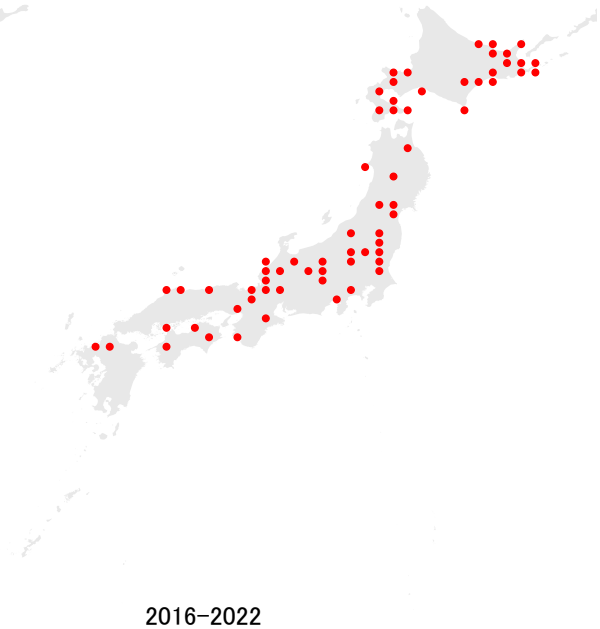


2016-2022

Asian Rosy Finch *Leucosticte arctoa* Length: 16-19cm Weight: 30g

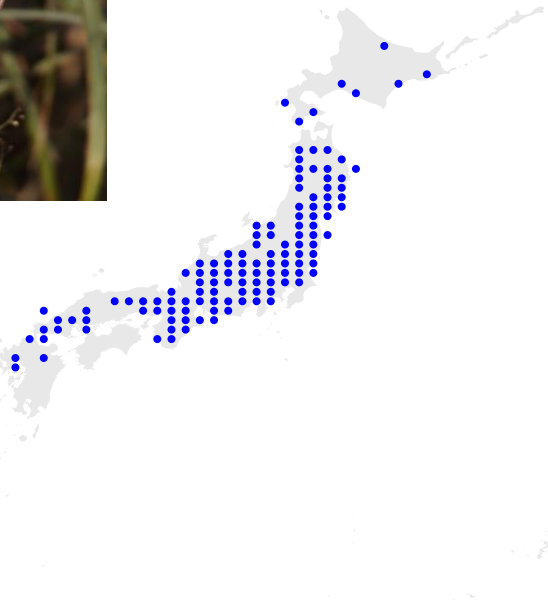


1984-1986（環境庁 1988）

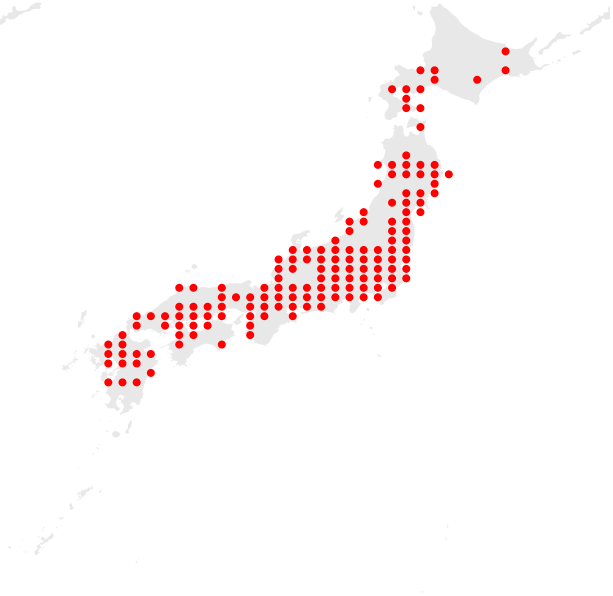


2016-2022

Long-tailed Rosefinch *Uragus sibiricus* Length: 15cm Weight: 14-16g

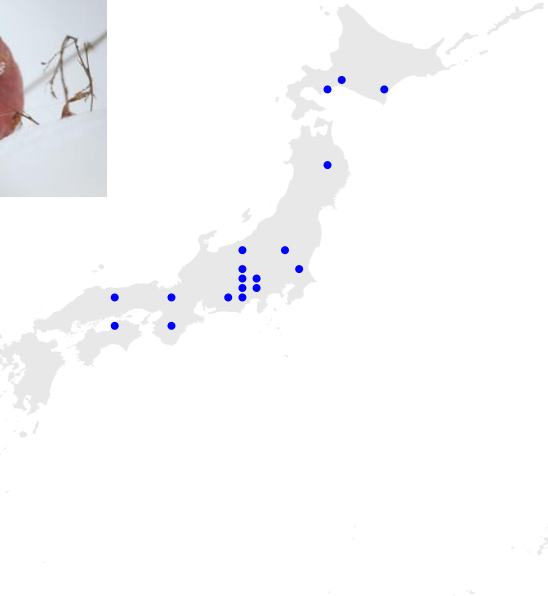


1984-1986（環境庁 1988）

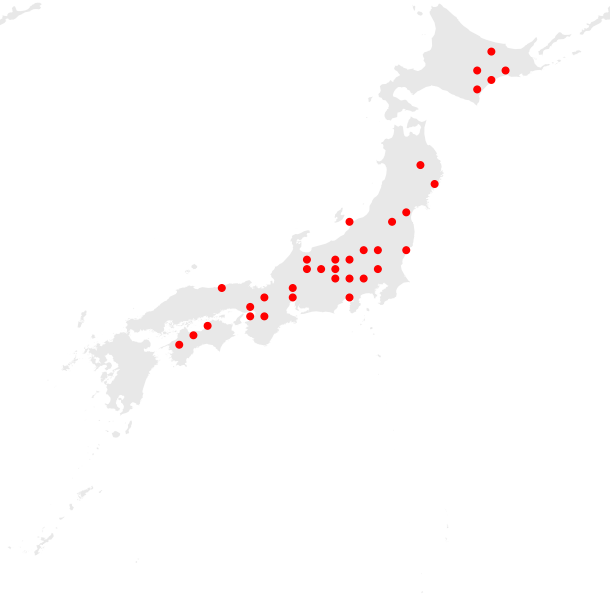


2016-2022

Pallas's Rosefinch *Carpodacus roseus* Length: 18cm Weight: 21-35g

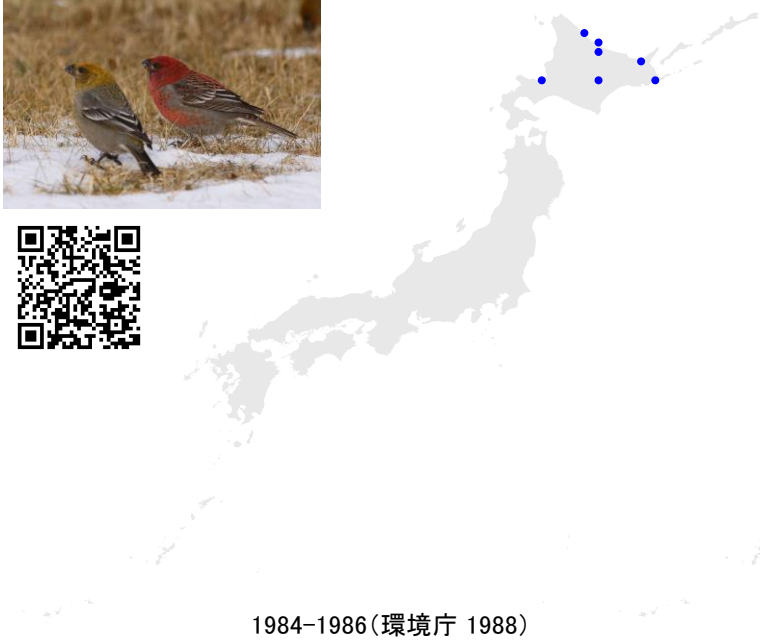


1984-1986（環境庁 1988）

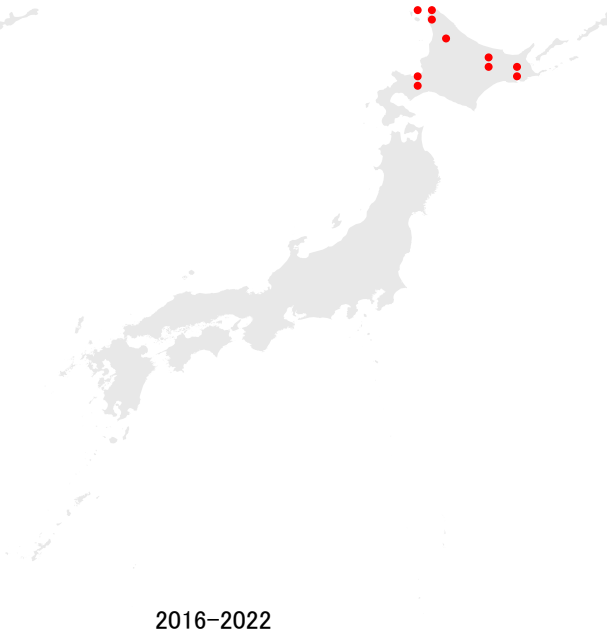


2016-2022

Pine Grosbeak *Pinicola enucleator* Length: 20cm Weight: 40-62g



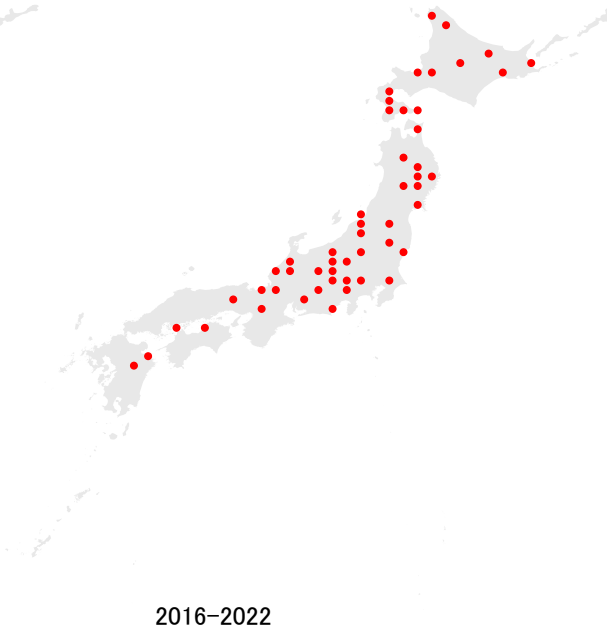
1984-1986(環境庁 1988)



2016-2022

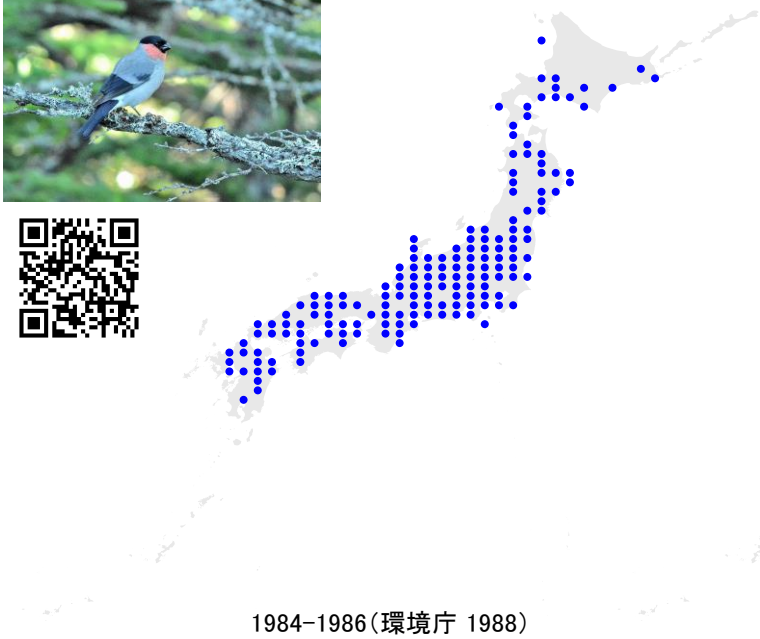
Red Crossbill *Loxia curvirostra* Length: 17-19cm Weight: ♂22.5-44.6g ♀25.8-47.2g

1984-1986(環境庁 1988)

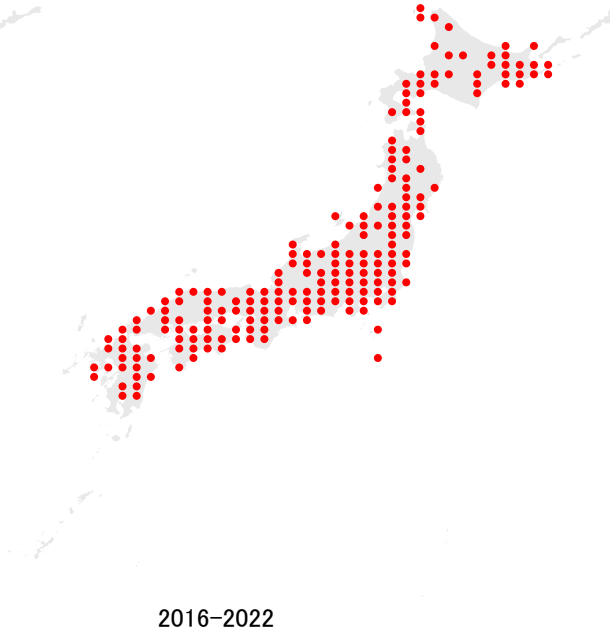


2016-2022

Eurasian Bullfinch *Pyrrhula pyrrhula* Length: 15-16cm Weight: 21-34g

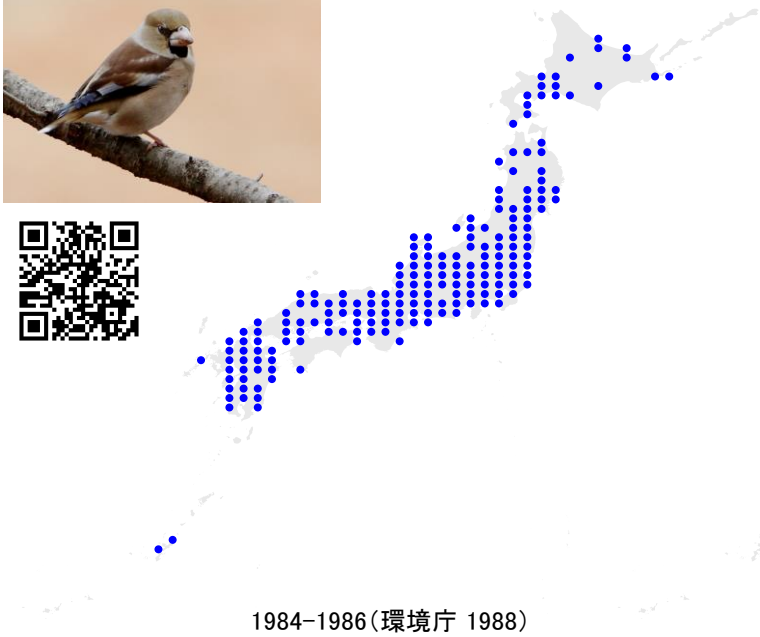


1984-1986（環境庁 1988）

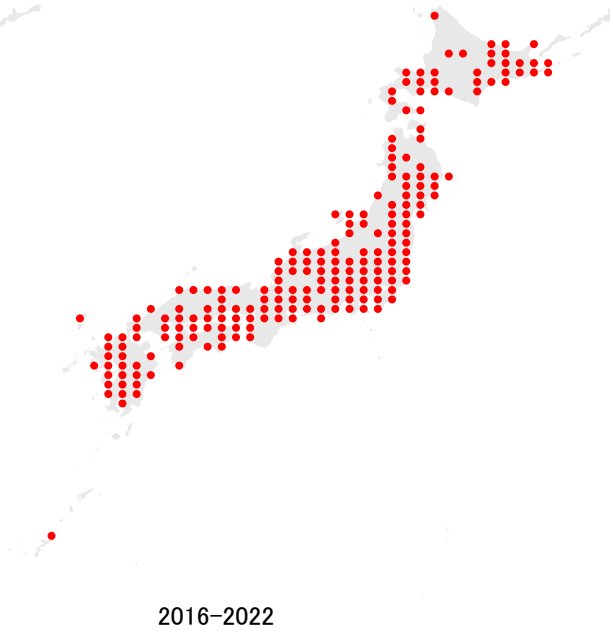


2016-2022

Hawfinch *Coccothraustes coccothraustes* Length: 18-19cm Weight: 45-65g

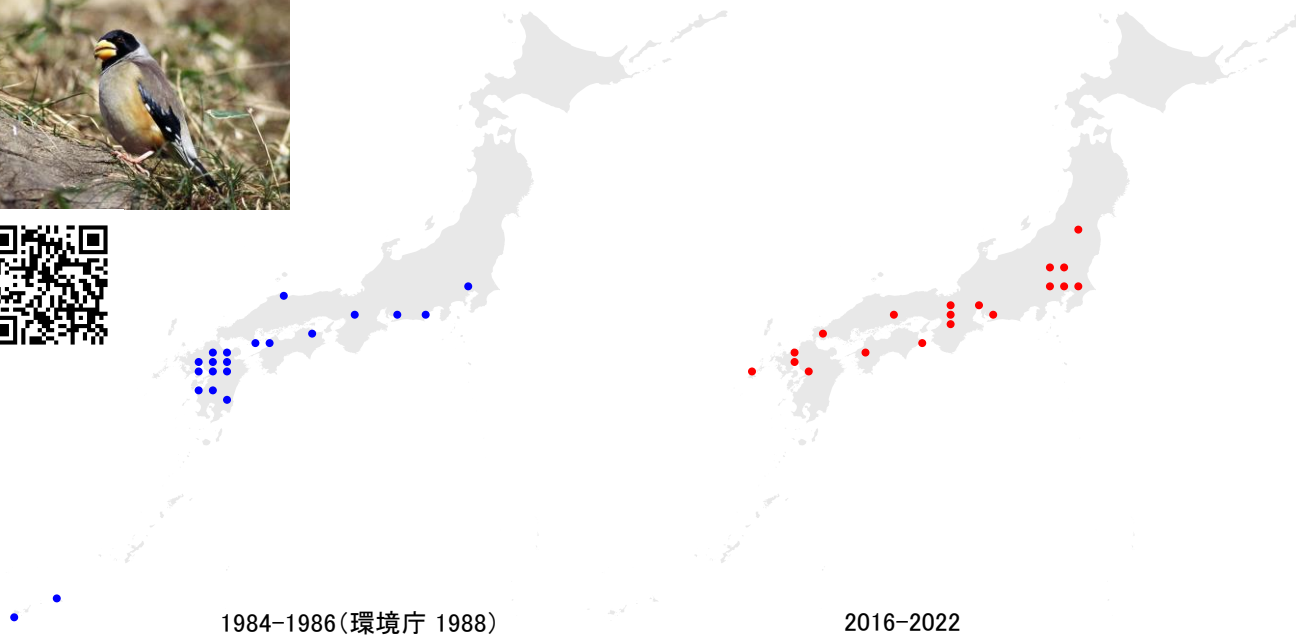


1984-1986（環境庁 1988）

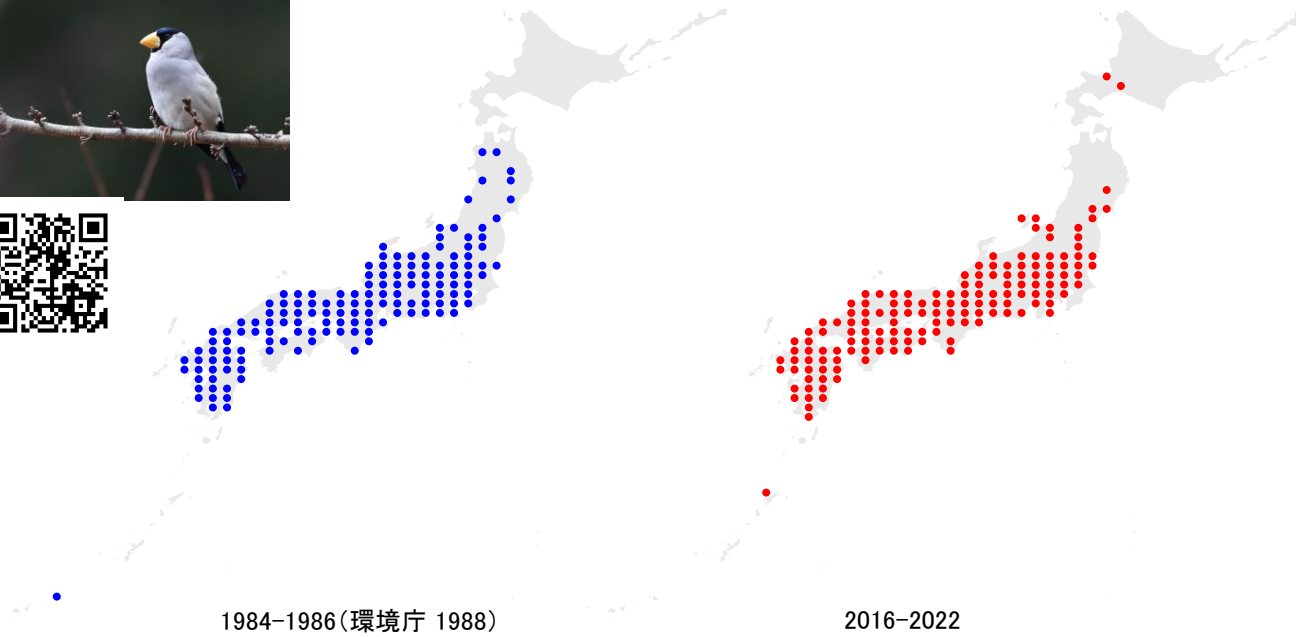


2016-2022

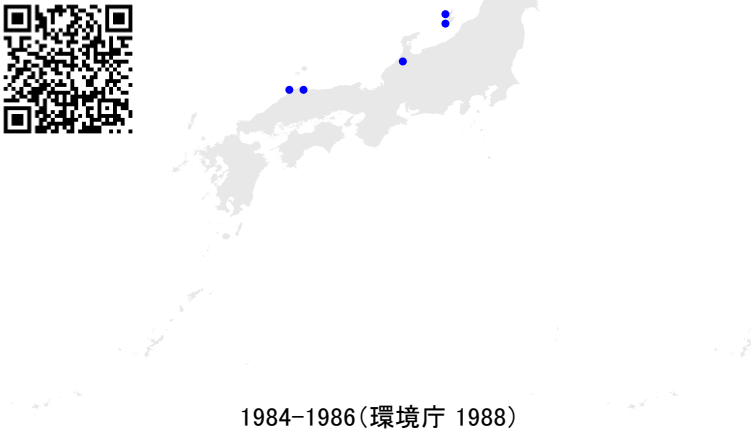
Chinese Grosbeak *Eophona migratoria* Length: 19cm Weight: 47-50g



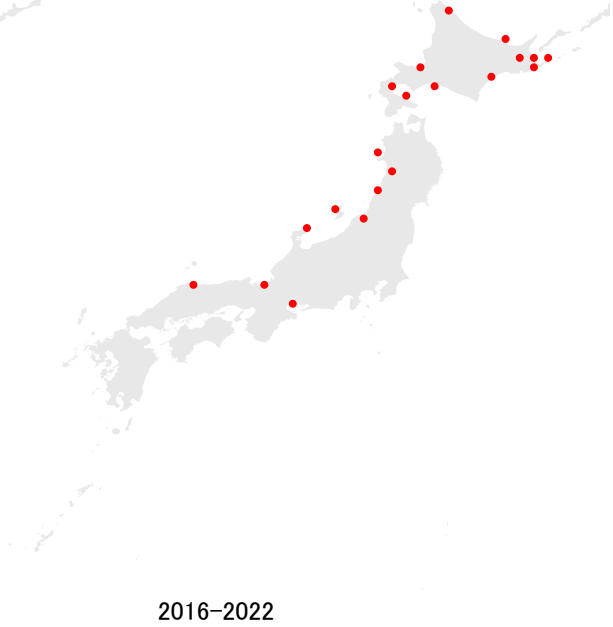
Japanese Grosbeak *Eophona personata* Length: 22-24cm Weight: 60-85g



Snow Bunting *Plectrophenax nivalis* Length: 16cm Weight: 28-34g

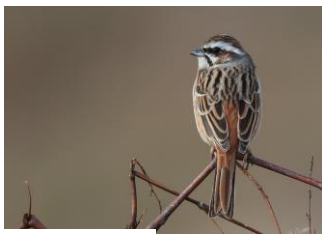


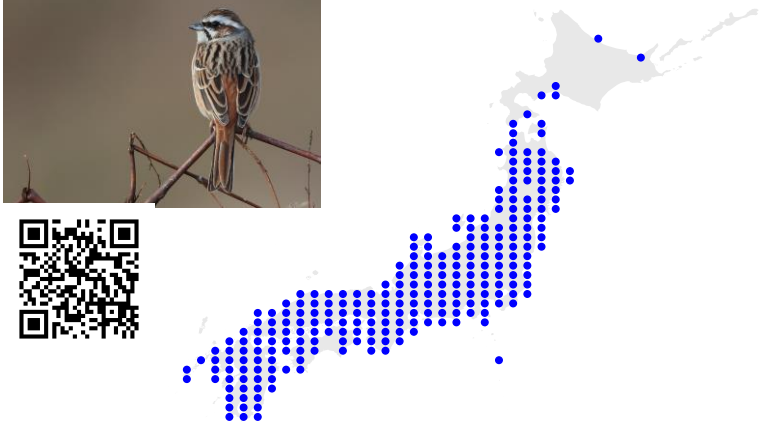
1984-1986（環境庁 1988）



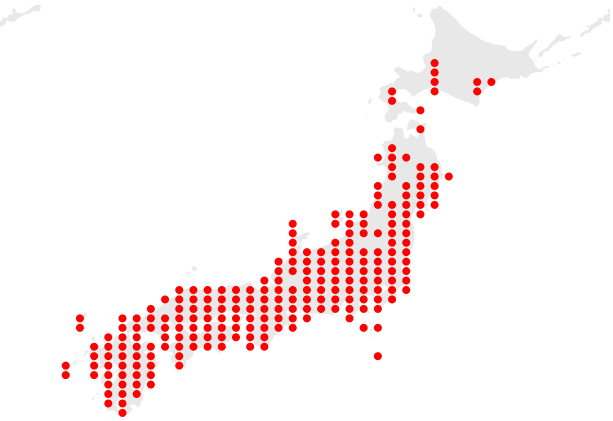
2016-2022

Meadow Bunting *Emberiza cioides* Length: 17cm Weight: 20-26g



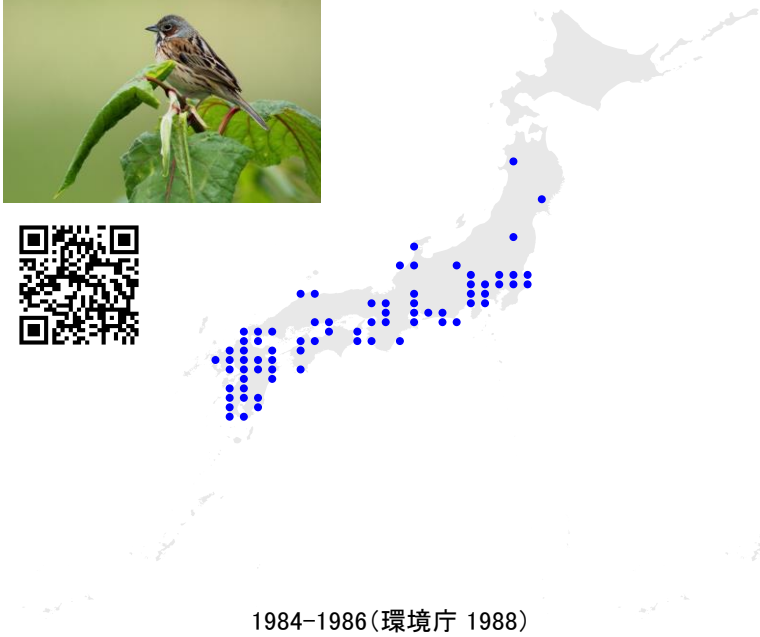


1984-1986（環境庁 1988）

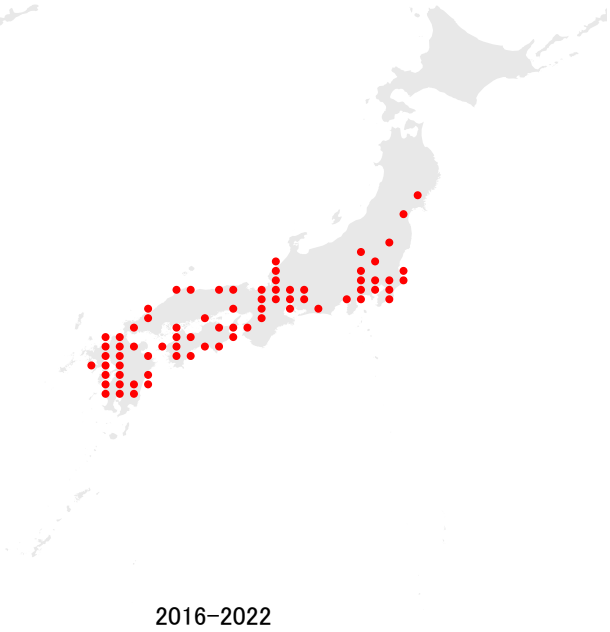


2016-2022

Chestnut-eared Bunting *Emberiza fucata* Length: 16cm Weight: 14-29g

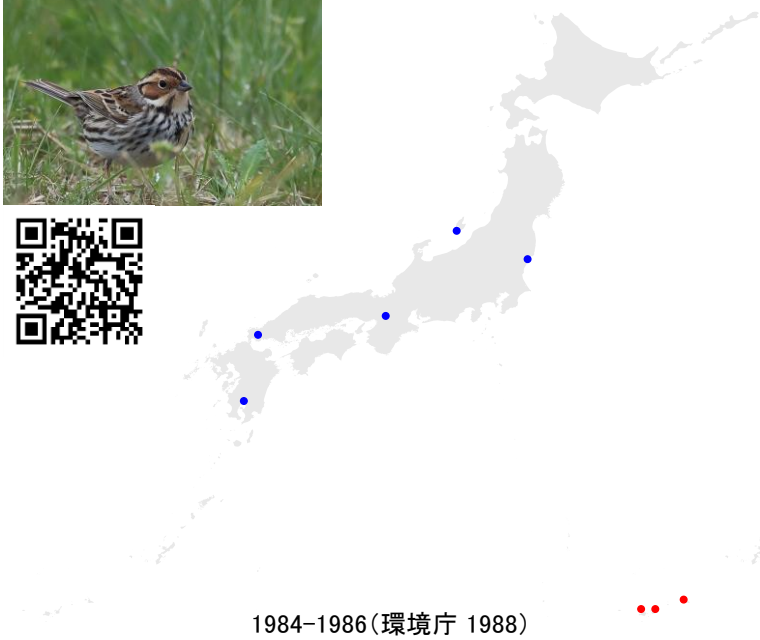


1984-1986(環境庁 1988)

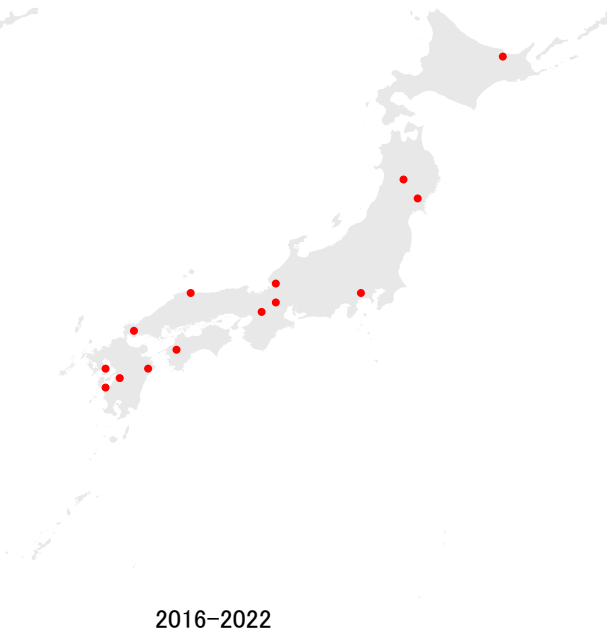


2016-2022

Little Bunting *Emberiza pusilla* Length: 13-14cm Weight: 13-15g

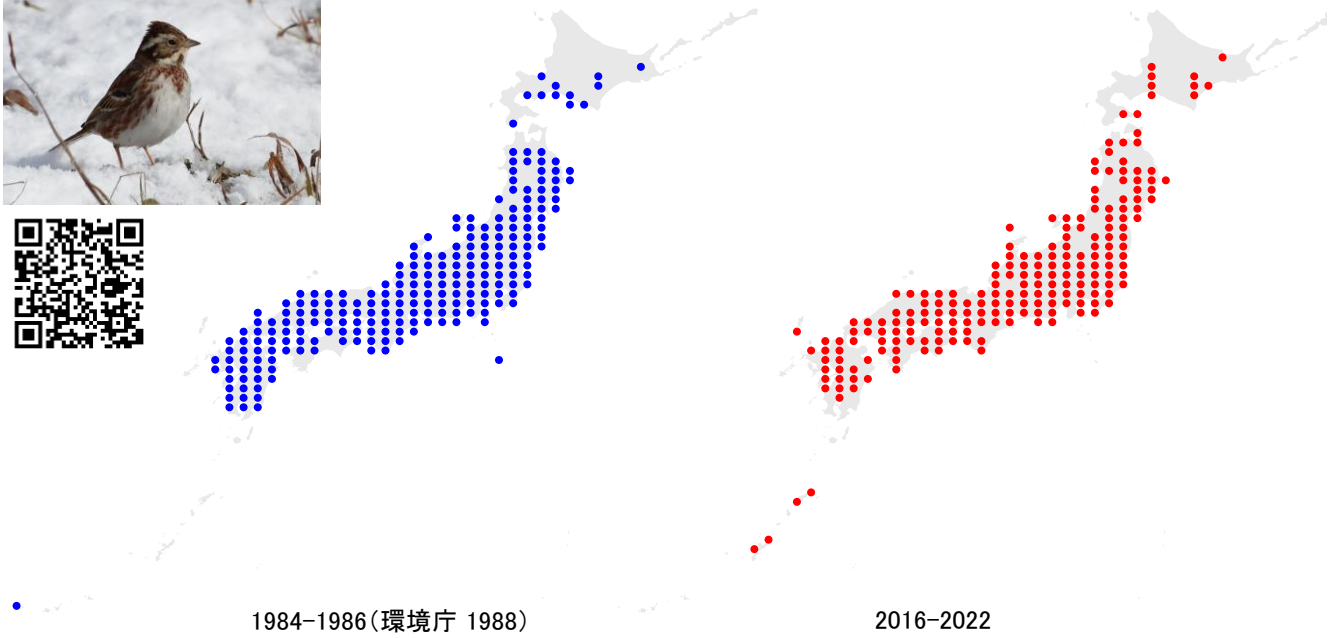


1984-1986(環境庁 1988)

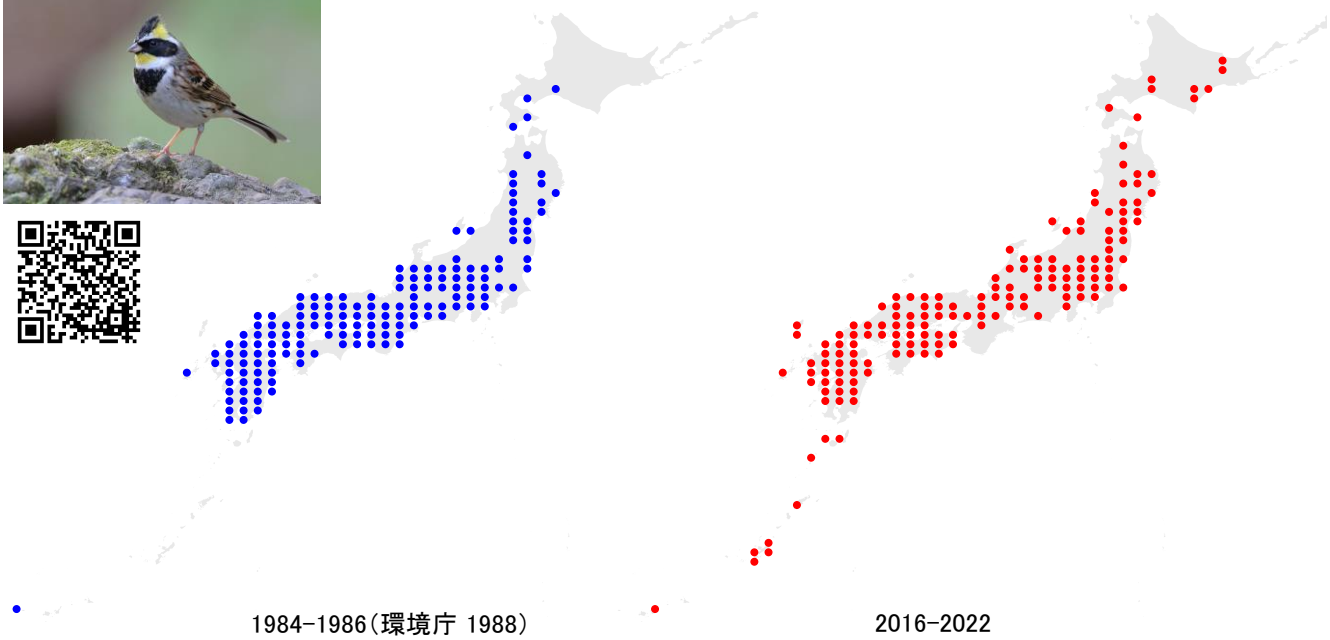


2016-2022

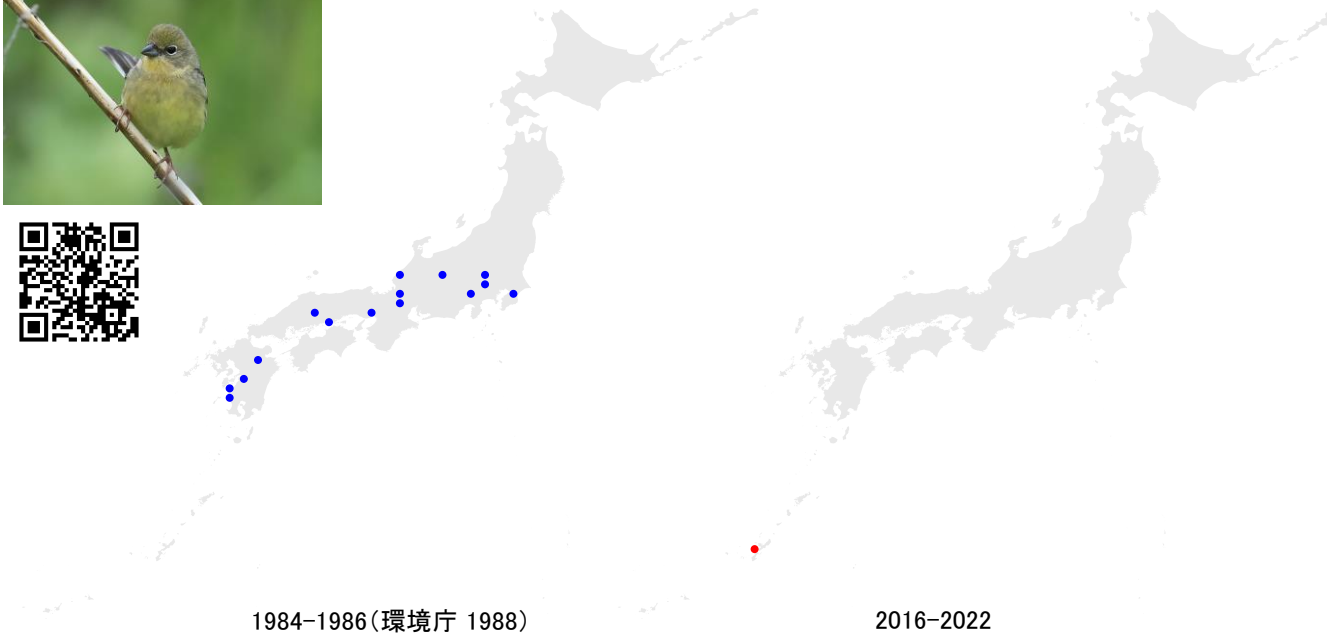
Rustic Bunting *Emberiza rustica* Length: 15cm Weight: 14-28g



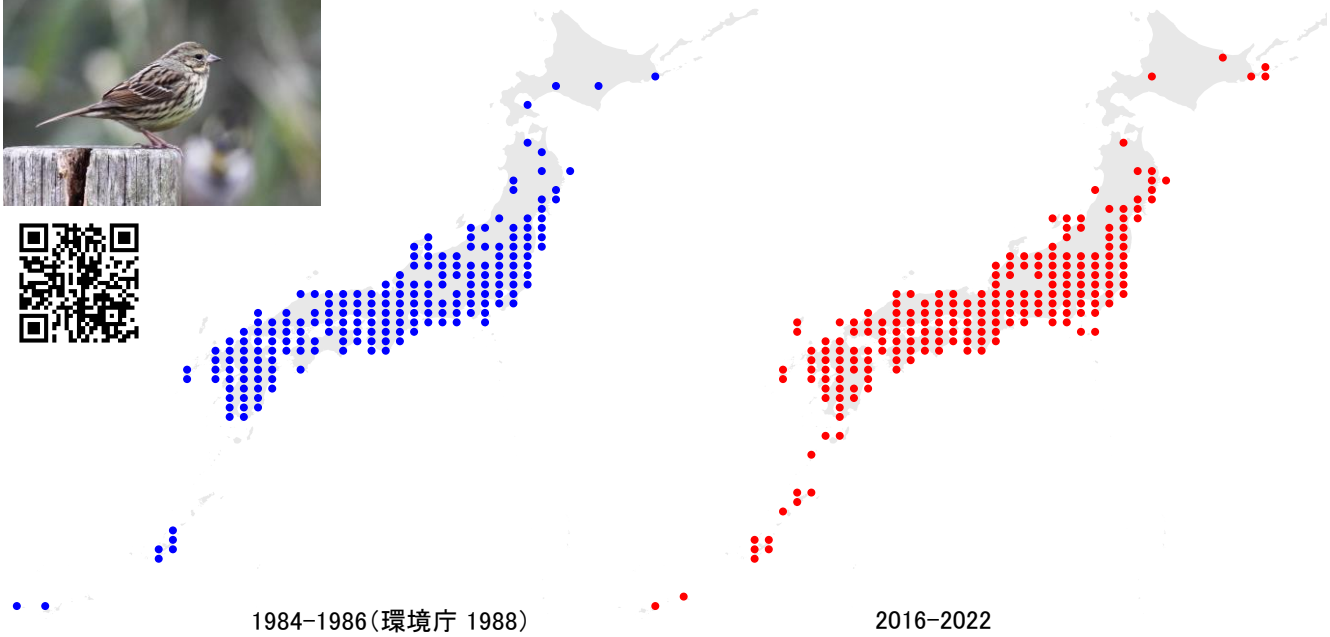
Yellow-throated Bunting *Emberiza elegans* Length: 15-17cm Weight: 15-24g



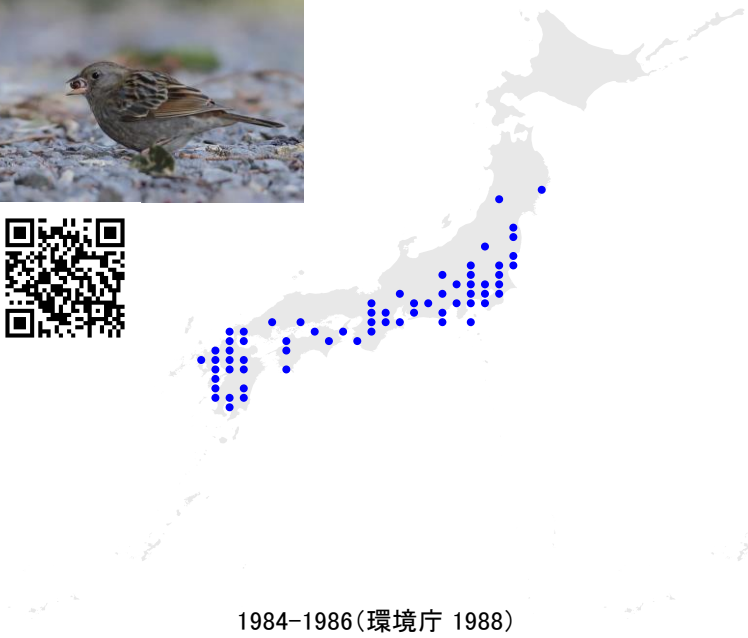
Yellow Bunting　*Emberiza sulphurata*　Length：13-14cm　Weight：♂13.4-18.3g ♀13.8-16.5g



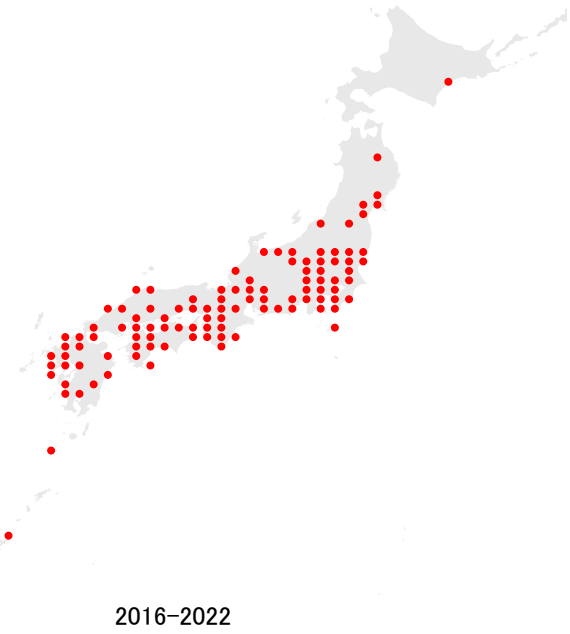
Black-faced Bunting　*Emberiza spodocephala*　Length：16cm　Weight：21g



Grey Bunting *Emberiza variabilis* Length: 17cm Weight: 20-38g



1984-1986（環境庁 1988）



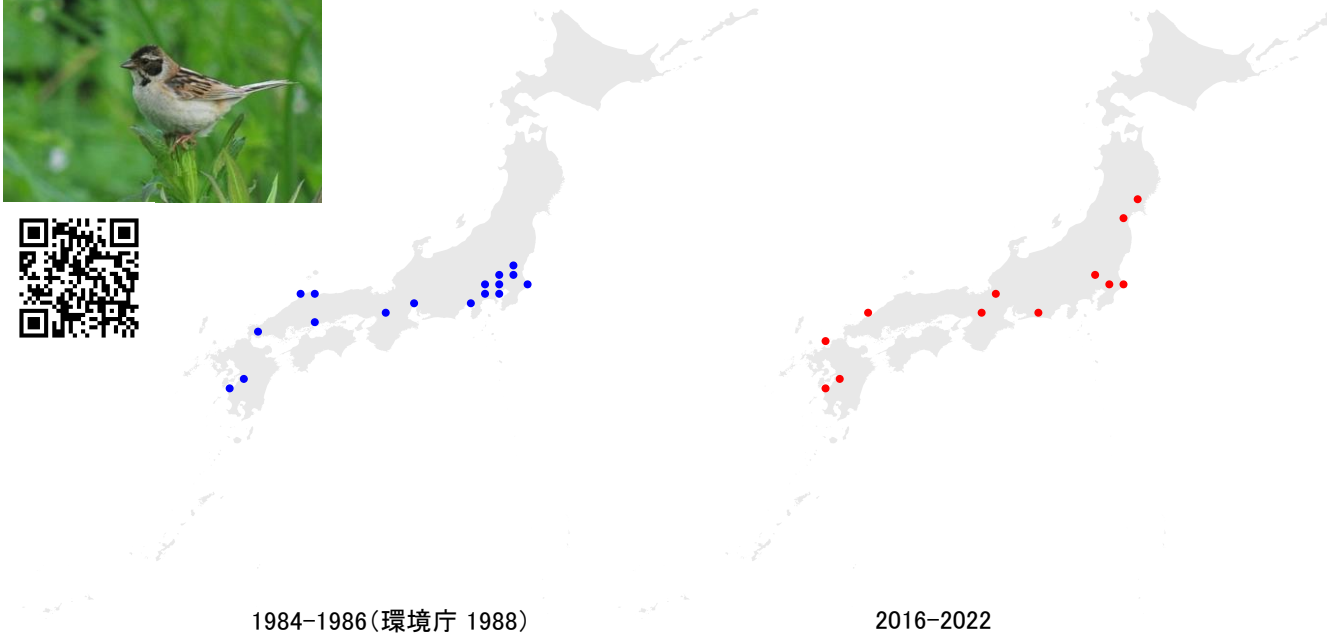
2016-2022

Pallas's Reed Bunting *Emberiza pallasi* Length: 13-14cm Weight: 13.6-16.4g

1984-1986（環境庁 1988）

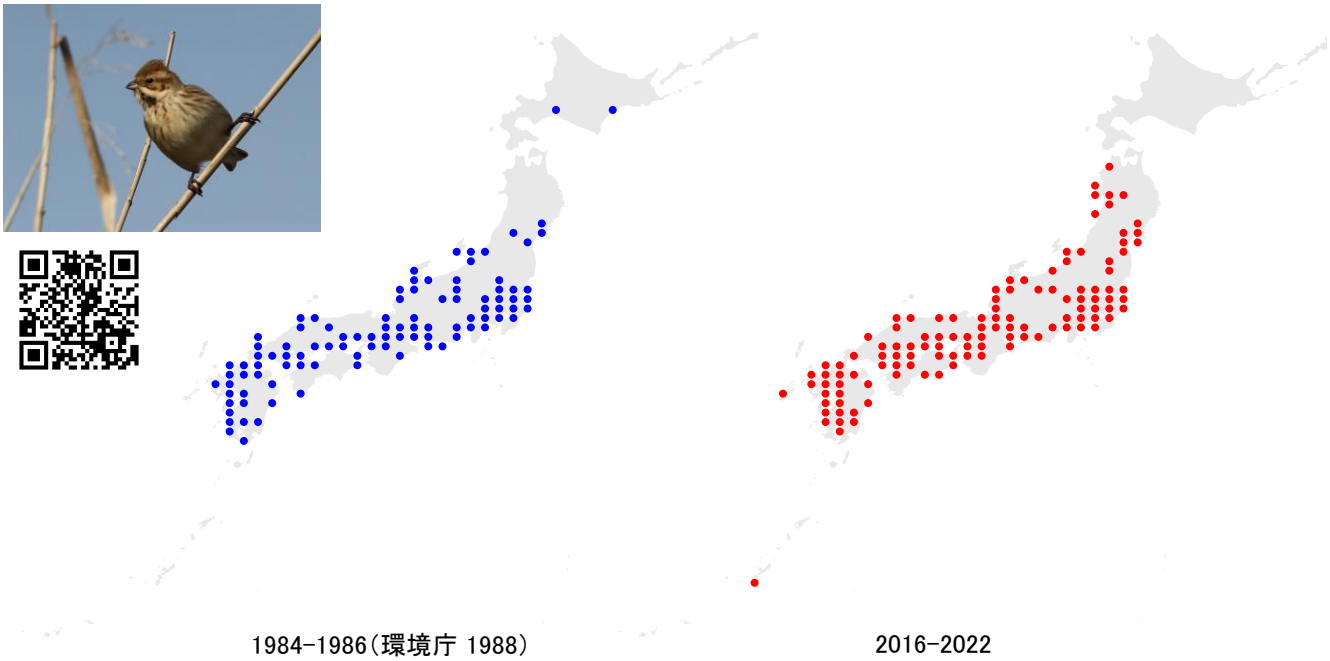
2016-2022

Japanese Reed Bunting *Emberiza yessoensis* Length: 15cm Weight: 13-14g



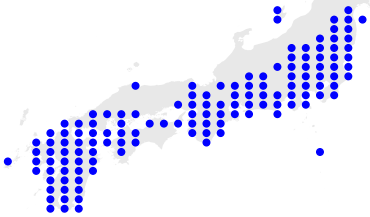
1984-1986（環境庁 1988） 2016-2022

Common Reed Bunting *Emberiza schoeniclus* Length: 16cm Weight: 20-21g



1984-1986（環境庁 1988） 2016-2022

Chinese Bamboo Partridge (invasive) *Bambusicola thoracicus* Length: 28-33cm Weight: 200-350g



1984-1986（環境庁 1988）

2016-2022

Indian Peafowl (invasive) *Pavo cristatus* Length: 90-130cm

1984-1986（環境庁 1988）

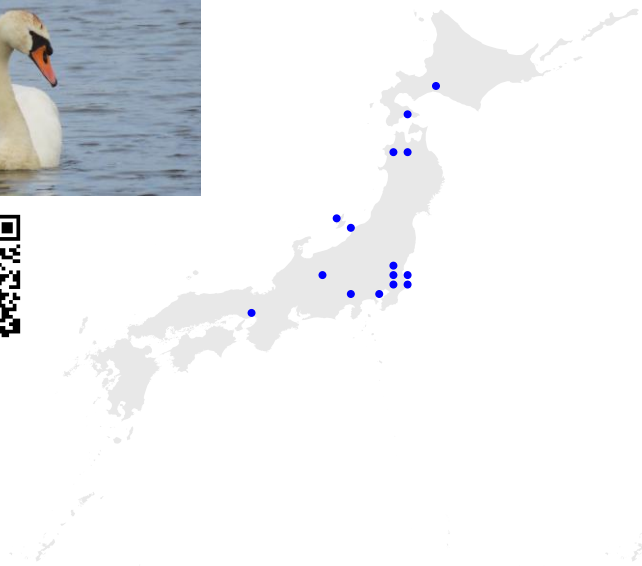
2016-2022

Black Swan (invasive)　*Cygnus atratus*　Length：110-140cm　Weight：3700-8700g

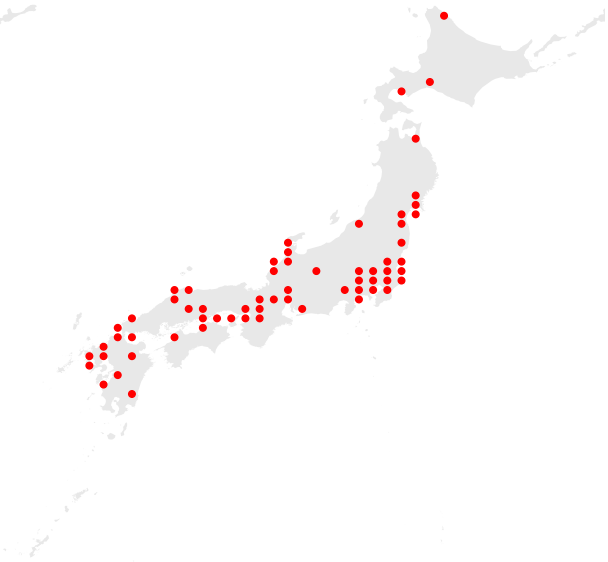
1984-1986（環境庁 1988）

2016-2022

Mute Swan (invasive)　*Cygnus olor*　Length：160cm　Weight：8000-16000g

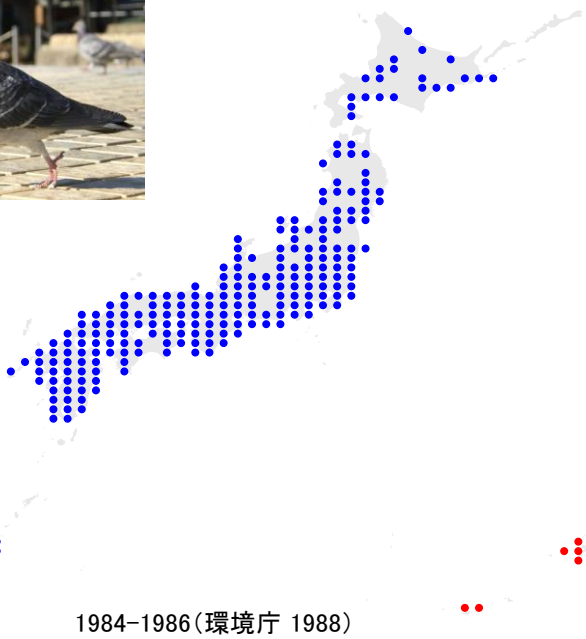


1984-1986（環境庁 1988）



2016-2022

Rock Dove (invasive) *Columba livia* Length: 31-34cm Weight: 314.2±35.63g



1984-1986(環境庁 1988)

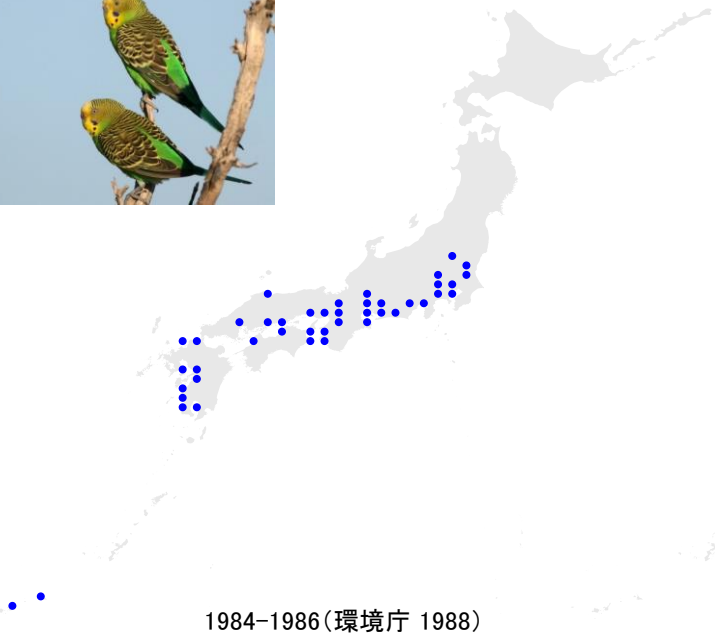
2016-2022

Eurasian Collared Dove (invasive) *Streptopelia decaocto* Length: 32.5cm Weight: 202-225g

1984-1986(環境庁 1988)

2016-2022

Budgerigar (invasive) *Melopsittacus undulatus* Length: 18cm



1984-1986(環境庁 1988)

2016-2022

Rose-ringed Parakeet (invasive) *Psittacula krameri* Length: 37-43cm Weight: ♂145.6±11.6g ♀145.5±9.4g

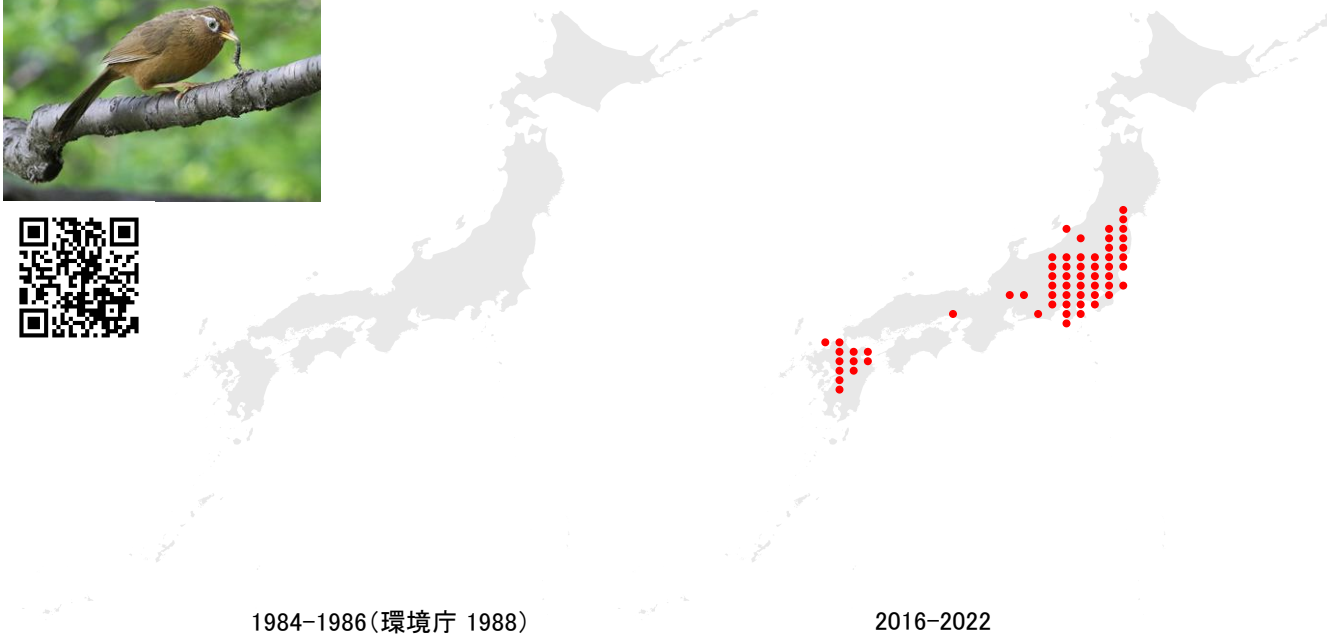
1984-1986(環境庁 1988)

2016-2022

Red-billed Blue Magpie (invasive) *Urocissa erythroryncha*

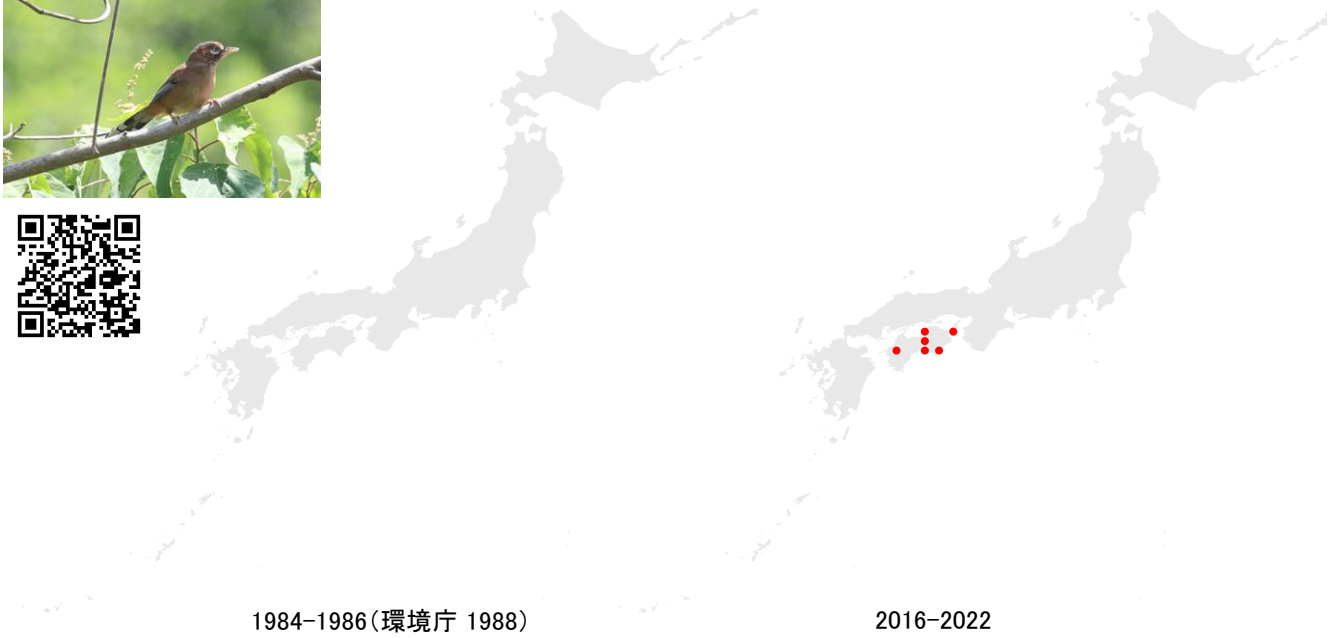
1984–1986（環境庁 1988） 2016–2022

Chinese Hwamei (invasive) *Garrulax canorus* Length： 21-24cm Weight： 49-75g



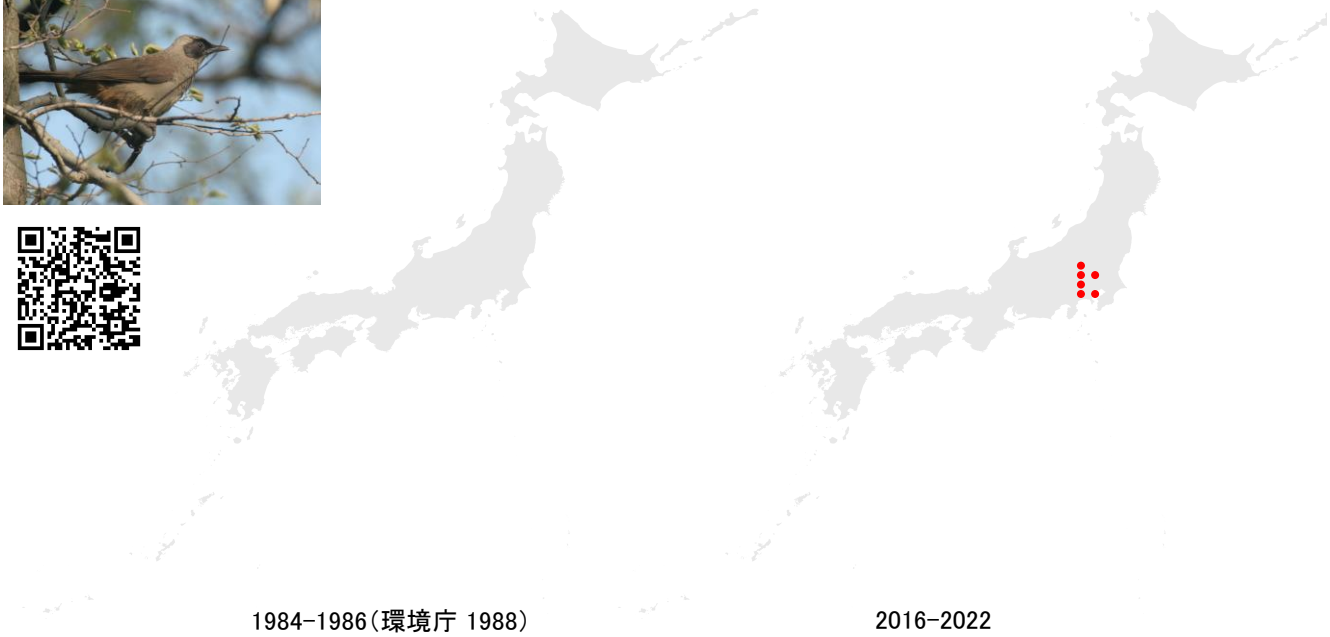
1984–1986（環境庁 1988） 2016–2022

Moustached Laughingthrush (invasive) *Garrulax cineraceus* Length: 21-24cm Weight: 43-55g



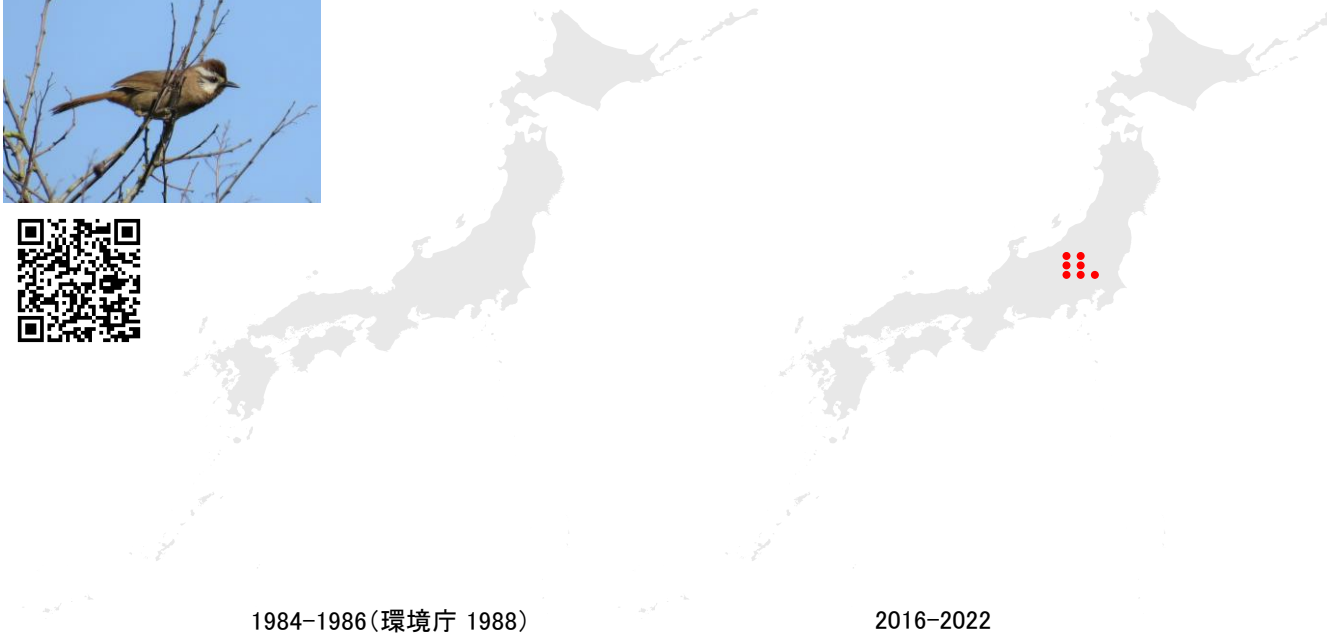
1984-1986（環境庁 1988） 2016-2022

Masked Laughingthrush (invasive) *Garrulax perspicillatus* Length: 30-34cm



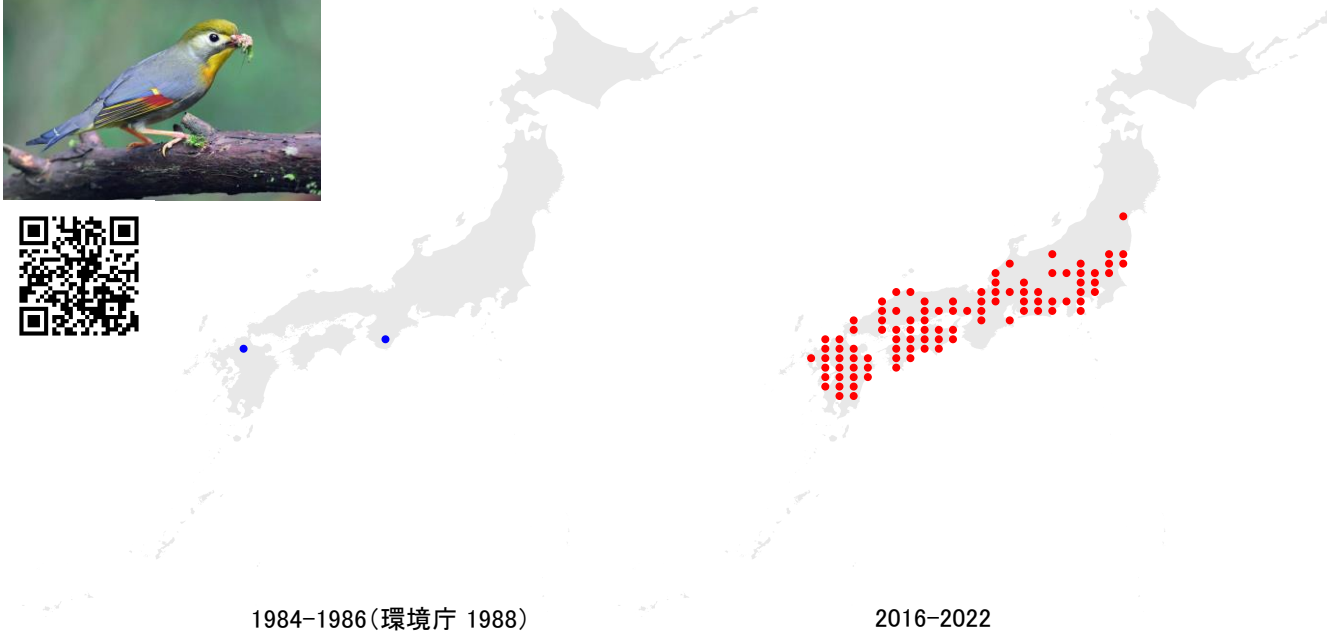
1984-1986（環境庁 1988） 2016-2022

White-browed Laughingthrush (invasive) *Garrulax sannio* Length: 22-24cm Weight: 52-83g



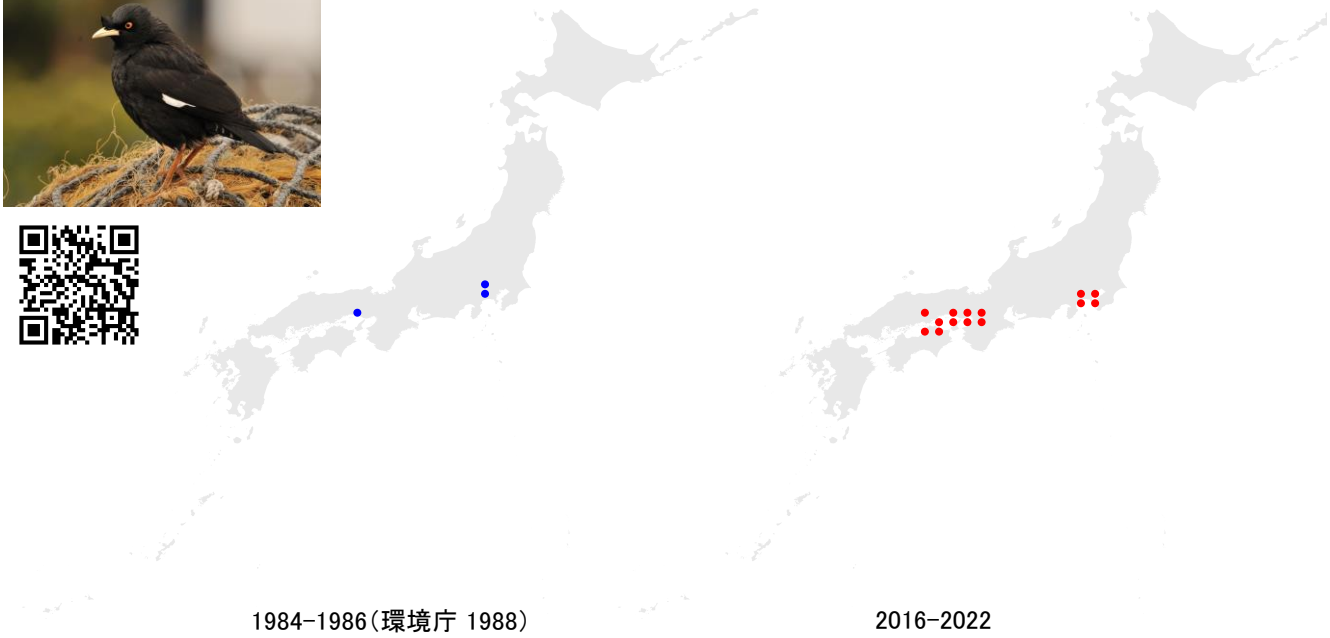
1984–1986（環境庁 1988） 2016–2022

Red-billed Leiothrix (invasive) *Leiothrix lutea* Length: 12.7-15.4cm Weight: ♂18.2-25.0g ♀19.6-24.2g



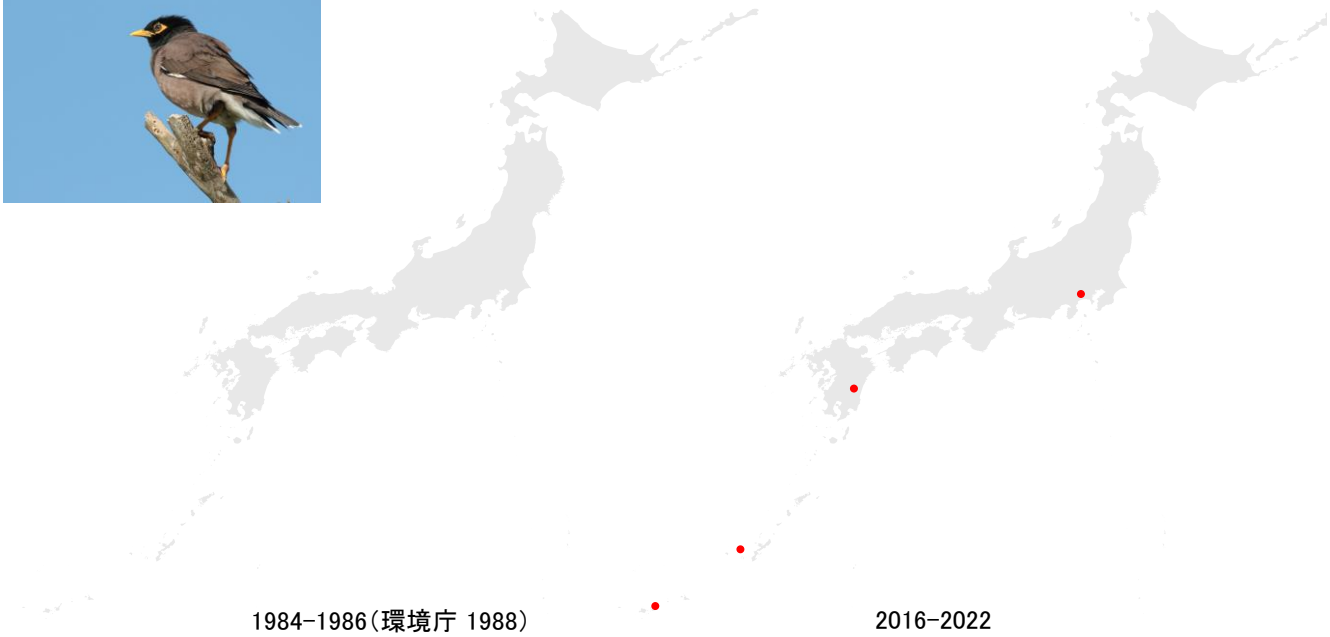
1984–1986（環境庁 1988） 2016–2022

Crested Myna (invasive) *Acridotheres cristatellus* Length: 26-27cm Weight: 108-140g



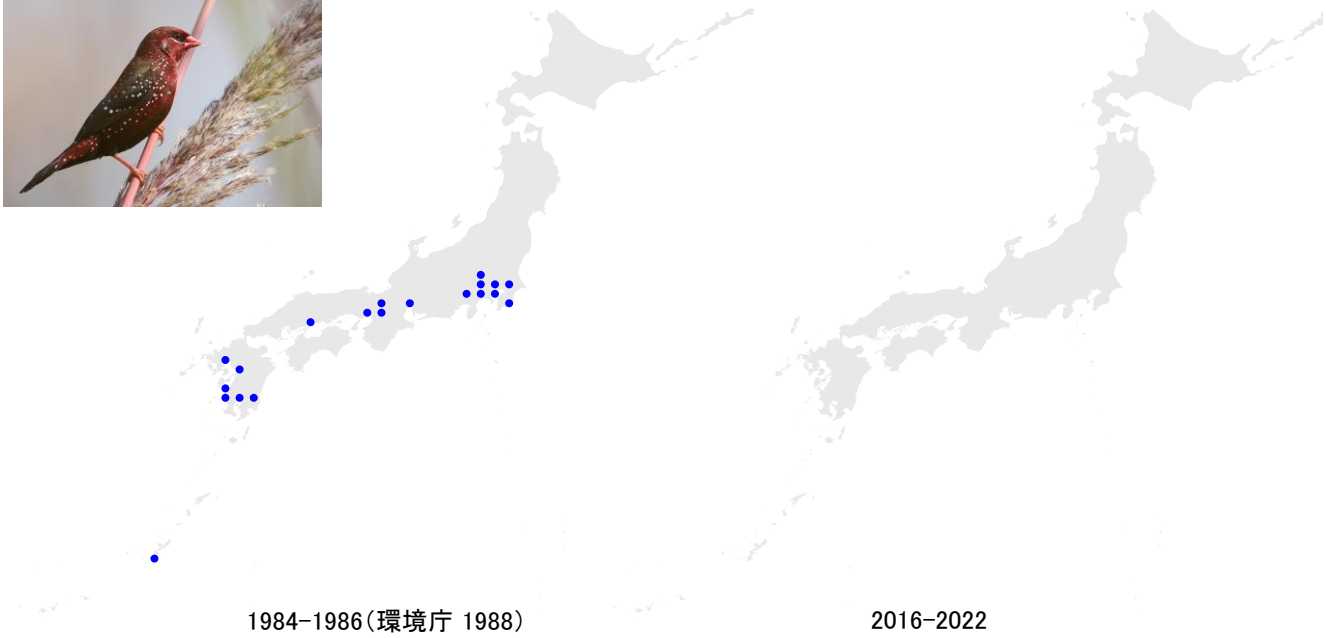
1984-1986（環境庁 1988） 2016-2022

Common Myna (invasive) *Acridotheres tristis* Length: 25cm

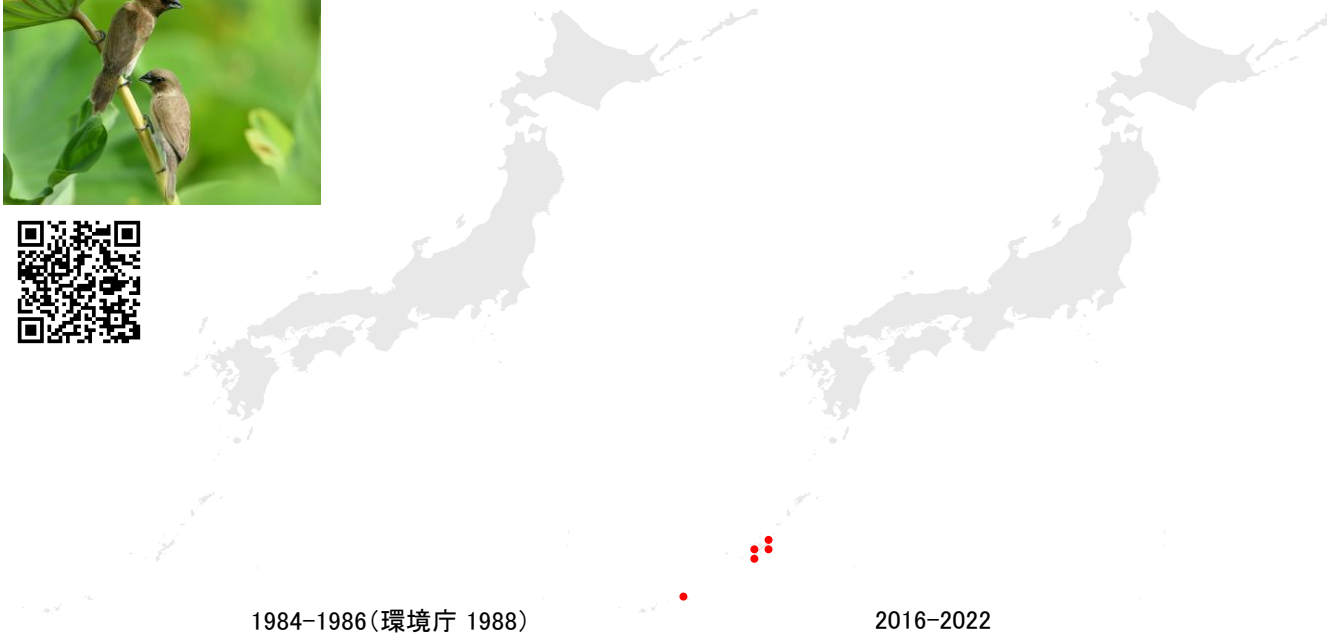


1984-1986（環境庁 1988） 2016-2022

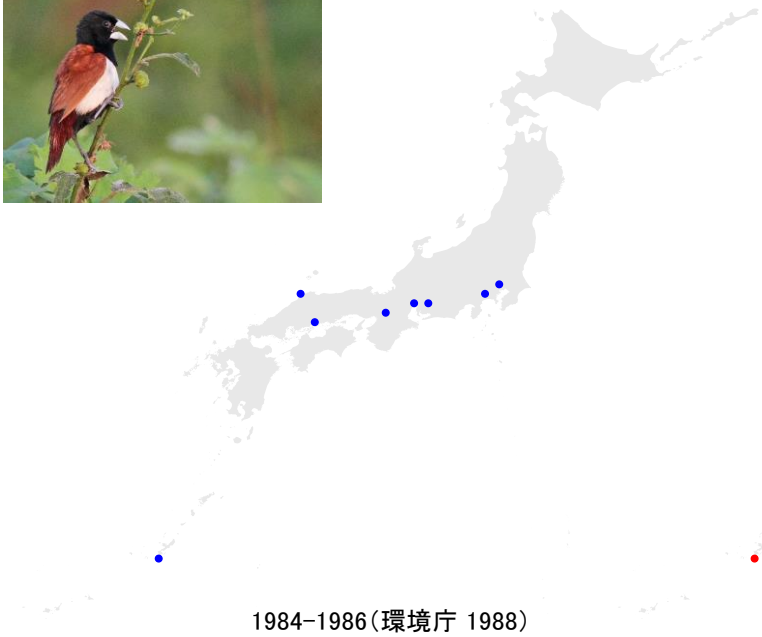
Red Avadavat (invasive) *Amandava amandava* Length： 10cm



Scaly-breasted Munia (invasive) *Lonchura punctulata* Length： 10cm



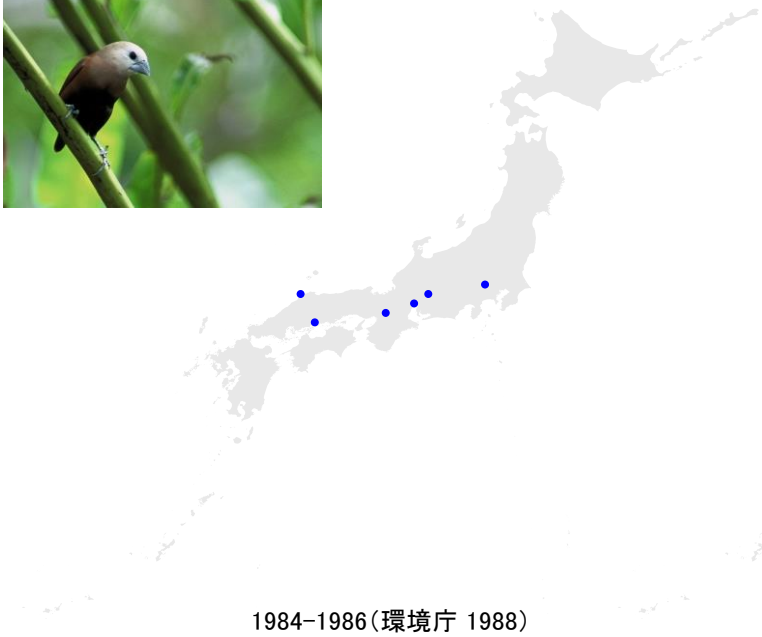
Tricolored Munia (invasive) *Lonchura malacca* Length: 11-12cm



1984-1986（環境庁 1988）

2016-2022

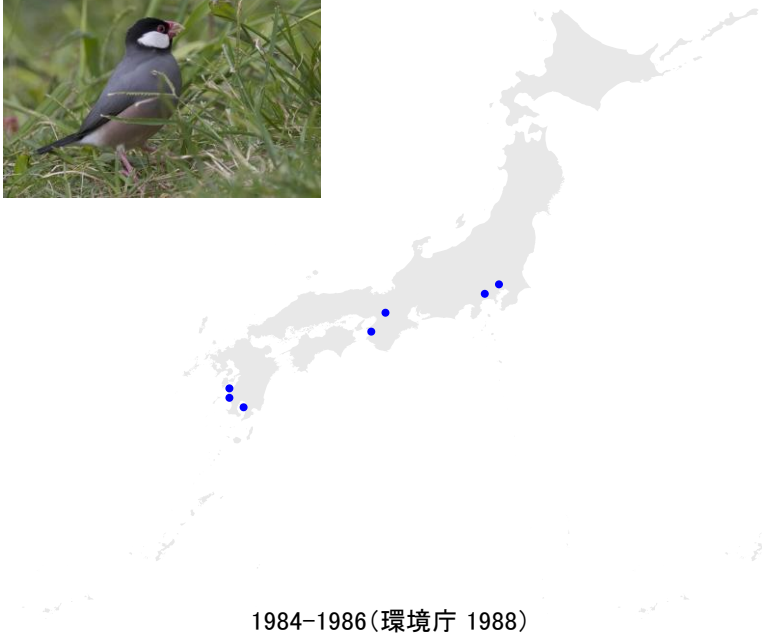
White-headed Munia (invasive) *Lonchura maja* Length: 11.5-12.0cm



1984-1986（環境庁 1988）

2016-2022

Java Sparrow (invasive)　*Lonchura oryzivora*　Length：14cm



1984-1986（環境庁 1988）

2016-2022

1. Current status of wintering birds in Japan

1) Range of wintering birds according to latitude

Japan has different climatic zones from north to south, ranging from subtropical to subarctic. Fig. 3 shows the number of species recorded in each mesh by latitude. In conjunction, the species richness and abundance of birds in the forests of the 1000 monitoring sites (2013-2017) are also indicated. The outlying islands of Nansei and Ogasawara Islands (24- 30°N) had low species richness, while those of the mainland areas (31°N and higher) were high in the south and low in the north, which was a common feature for both surveys. Species richness tends to be lower in the north, with waterbirds more susceptible to freezing and snow cover showing this trend. Waterbirds were included in the JWBA survey but not in the Monitoring Site 1000 survey. Therefore, the phenomenon of low species counts in the JWBA result is probably evident at sites further south than in the Monitoring Site 1000 result. It should be noted, however, that the JWBA is based on a questionnaire-based survey, but not on a field survey, so the difference in the amount of survey effort could strongly affect the results.

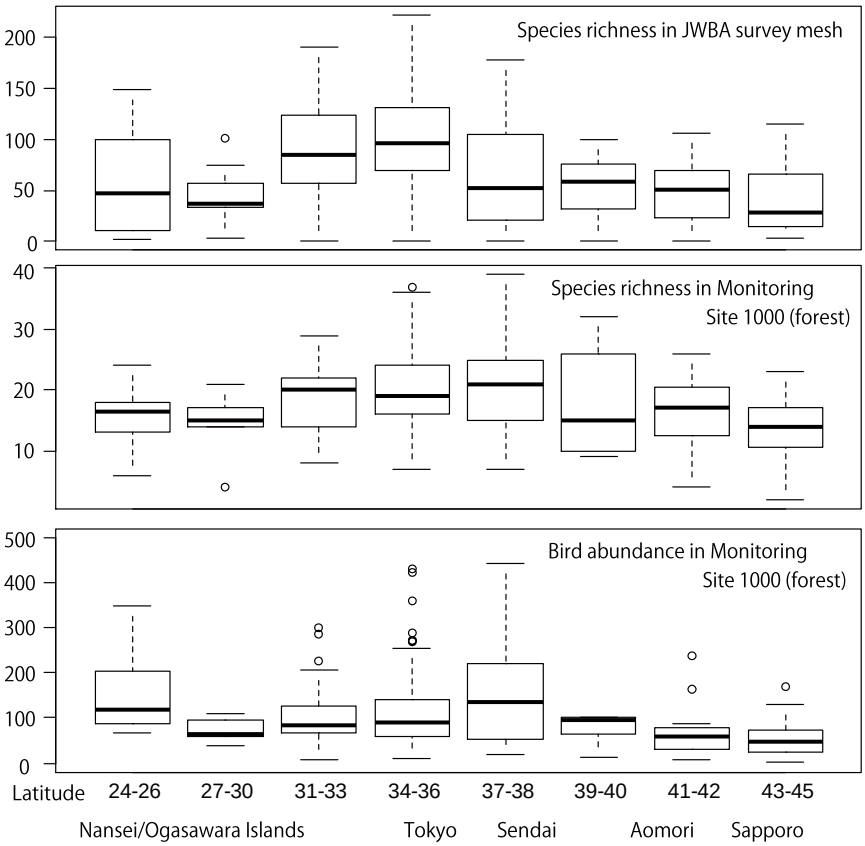


Fig. 3. Relationship between the species richness and abundance of birds recorded at each mesh study site and latitude.

2) Dominant bird species in winter

Table 1 shows the species dominant in the mesh count during the wintering season. In the 2010s, Brown-eared Bulbul, Large-billed Crow, Dusky Thrush, Japanese Tit, and Carrion Crow, in that order, were recorded in many meshes, and these top species remained the same as in the 1980s. The most common waterbird species recorded in the 2010s that were not in the top 20 in the 1980s were Eurasian Teal, Grey Heron, Eurasian Coot, Eurasian Wigeon, and Great Cormorant.

Table 1. List of top 20 species and the number of recorded mesh during the wintering period in the 1980s and 2010s. The total mesh were 338 data in the 1980s and 370 in the 2010s. *invasive species.

1984-1986 year		2016-2021 year	
Species	Number of mesh	Species	Number of mesh
Large-billed Crow	312	Brown-eared Bulbul	328
Eurasian Tree Sparrow	311	Large-billed Crow	325
Brown-eared Bulbul	299	Dusky Thrush	301
Carrion Crow	295	Japanese Tit	299
Black Kite	291	Carrion Crow	293
Japanese Tit	284	Black Kite	286
Dusky Thrush	264	Mallard	282
White Wagtail	263	Eurasian Tree Sparrow	279
Mallard	259	Japanese Pygmy Woodpecker	279
Oriental Turtle Dove	254	White Wagtail	273
Meadow Bunting	251	Eastern Spot-billed Duck	269
Long-tailed Tit	247	Varied Tit	266
White-cheeked Starling	242	Long-tailed Tit	257
Eastern Spot-billed Duck	240	Eurasian Teal	257
Japanese Pygmy Woodpecker	238	Grey-capped Greenfinch	256
Rock Dove *	235	Grey Heron	255
Bull-headed Shrike	235	Daurian Redstart	248
Grey-capped Greenfinch	234	Eastern Buzzard	248
Japanese Wagtail	232	Eurasian Coot	248
Rustic Bunting	229	Eurasian Wigeon	246
		Great Cormorant	246

3) Species with a north-south range deviation

Japan is an archipelago extending in a northeasterly direction. The north and south deviation of the species range is shown based on the value obtained by adding the latitude and longitude (called the latitude-longitude value; a larger value means a more northeasterly range) to indicate their position in the Japanese Islands. We selected species with more than 30 mesh records and showed their range of the south quadrant of the

latitude and longitude values. Table 2 shows the species with a range deviation to the north (left), and to the south (right). The species with the larger south quadrant of the range were shown as north-deviated, and species with a larger north quadrant of the range were indicated as south-deviated.

The species with range deviated to the north were dominated by those with range centers in Hokkaido, such as Marsh Tit, Steller's Sea Eagle, White-tailed Eagle, and Common Redpoll, as well as many seabirds. Although not a northerly bird, Azure-winged Magpie was listed as a northerly species because of its special distribution that it is not found in western Japan.

Black-faced Spoonbill, Chinese Penduline Tit, Ashy Minivet and Common Shelduck topped the list of species whose range was deviated toward the south, while shorebirds and other species that use tidal flats were abundant in the top 20 southerly species.

Table 2. Species with significant distributional deviations, expressed as quartiles of the sum of latitude and longitude. *invasive species.

North-deviated species			South deviated species		
Species	South 25% point	n	Species	North 25% point	n
Marsh Tit	184.9	53	Black-faced Spoonbill	167.6	42
Steller's Sea Eagle	180.0	87	Chinese Penduline Tit	168.4	33
White-tailed Eagle	179.8	113	Ashy Minivet	169.8	103
Common Redpol	177.3	39	Common Shelduck	170.1	68
Glaucous Gull	176.5	72	Common Greenshank	170.9	57
Snow Goose	175.7	34	Saunders's Gull	171.2	46
Glaucous-winged Gull	175.5	75	Lesser Sand Plover	171.7	39
Cackling Goose	175.5	34	Eurasian Spoonbill	171.8	45
Black Scoter	174.5	100	Pacific Golden Plover	171.8	41
Azure-winged Magpie	174.4	55	Asian House Martin	171.9	77
Harlequin Duck	174.2	110	Russet Sparrow	171.9	45
Red-throated Loon	174.1	57	Eurasian Curlew	172.0	31
Black-legged Kittiwake	174.0	48	Black-winged Stilt	172.2	36
Spotted Nutcracker	173.9	33	Ruddy-breasted Crake	172.3	69
Great Spotted Woodpecker	173.9	183	White-bellied Green Pigeon	172.4	118
Horned Grebe	173.8	91	Zitting Cisticola	172.4	74
Red-necked Grebe	173.8	83	Grey Plover	172.6	58
Brant Goose	173.6	51	Oriental Stork	172.6	45
Eurasian Treecreeper	173.6	81	Chestnut-eared Bunting	172.7	75
Whooper Swan	173.5	135	Red-billed Leiothrix *	173.0	96

2. Increase/decrease of range and its factors

The top 20 species were listed in terms of the change rate calculated as follows based on the number of meshes where each species was recorded for the 317 meshes for which information was available in both the 1980s and the 2010s.

(Number of meshes recorded in the 2010s survey - Number of meshes recorded in the 1980s survey) ÷ Number of meshes recorded in the 1980's survey x 100

1) Species with reduced range

The top species with reduced range were Budgerigar, Japanese Quail, Striated Heron, Crested Kingfisher, and Black-crowned Night Heron (Table 3). Many of the top 20 declining species showed the same declining trend also in the JBBA survey (Ueta & Uemura 2021) and the Monitoring Site 1000 Shorebird Survey (Biodiversity Center, Nature Conservation Bureau, Environment Agency 2020), suggesting that population decline has also led to the range contraction.

Table 3. Changes in the number of meshes for the top 20 species recorded. Based on 317 meshes for which data were available in both the 1980s and the 2010s. *invasive species.

Species with shrinking distribution				Species with expanding distribution			
Species	1980s	2010s	Change	Species	1980s	2010s	Change
Budgerigar *	43	1	-97.7	Chinese Hwamei *	0	60	
Japanese Quail	32	11	-65.6	Snow Goose	0	34	
Striated Heron	31	13	-58.1	Red-billed Leiothrix *	2	95	4650.0
Crested Kingfisher	151	77	-49.0	Cackling Goose	1	33	3200.0
Black-crowned Night Heron	171	98	-42.7	Oriental Stork	2	44	2100.0
Intermediate Egret	73	43	-41.1	Eurasian Spoonbill	3	44	1366.7
Wood Sandpiper	44	26	-40.9	Hooded Crane	4	35	775.0
Eastern Cattle Egret	41	27	-34.1	Common Starling	7	50	614.3
Chinese Bamboo Partridge *	130	95	-26.9	Common Shelduck	10	65	550.0
Little Egret	209	154	-26.3	Ashy Minivet	16	94	487.5
Azure-winged Magpie	73	55	-24.7	Bean Goose	16	86	437.5
Black-headed Gull	167	126	-24.6	Solitary Snipe	8	42	425.0
Northern Lapwing	133	104	-21.8	Black-faced Spoonbill	8	39	387.5
Rock Dove (invasive)	230	187	-18.7	Great Cormorant	51	234	358.8
Pacific Reef Heron	75	63	-16.0	Ruddy-breasted Crake	15	68	353.3
Common Snipe	157	132	-15.9	Mute Swan *	15	63	320.0
Mew Gull	147	124	-15.6	Black-winged Stilt	9	35	288.9
Brown Dipper	177	151	-14.7	Greater White-fronted Goose	23	88	282.6
Kentish Plover	112	96	-14.3	Daurian Jackdaw	15	56	273.3
Japanese Sparrowhawk	65	56	-13.8	Eurasian Coot	63	231	266.7

2) Species with expanded range

The top species that expanded their range were introduced and reintroduced species, such as Chinese Hwamei, Snow Goose, Red-billed Leiothrix, Cackling Goose, and Oriental Stork (Table 3). The increase in the abundance of these species is assumed to be a result of their successful establishment and expansion of the range. The ecological characteristics of the other top 20 species showed that many of them were waterbirds or ground feeders. These species are more susceptible to the effects of snow cover and freezing temperatures, and it is possible that their range are expanding as a result of global warming, which has eased the coldness of winters. Since the range expansion includes not only the northward expansion of the range but also the increase in population size, we selected species with the northward expansion and examined the relationship between the degree of northward range expansion and ecological characteristics. Since the Japanese archipelago extends in a northeasterly direction, we evaluated the range based on the latitude-longitude value obtained by adding latitude and longitude (the larger this value is, the more northerly the range), as in the extraction method for "species whose range is deviated north-south", in order to indicate the position of range in this archipelago direction. The median latitude-longitude values of the mesh on which each bird species was recorded were calculated for the 1980s and 2010s, the difference between the median values in the 2010s and 1980s (a positive value means the range deviation northward, a negative value is a deviation southward). The species with a small number of mesh records are not suitable for analyzing the relationship between changes and ecological characteristics due to the following factors: 1) chance influences the evaluation of range, 2) very little information on the range of island birds was available in the 1980s (e.g., no records from the northern part of the Nansei Islands, and little information from the Ogasawara Islands), making range changes of these outlying island birds unreliable. Therefore, we excluded species from this tabulation that lack records of more than 10 meshes in both periods, and those in which the islands are the main range area (Japanese Wood Pigeon and Taiwan Green Pigeon among the species with more than 10 meshes). The top species whose range has moved northward included Daurian Jackdaw, Rook, and Ashy Minivet (Table 4). As for Pacific Loon, the lack of information on seabirds in the 1980s largely affected the range of this species, suggesting that it may not have moved northward in range.

Looking at birds in the ecological characteristic groups, arboreal, grassland, and forest ground birds, seabirds, and raptors showed a range trend centered at 0, with no directional

change in range (Fig. 4). On the other hand, the birds that have expanded their range to the north included ground-feeding birds that inhabit open areas (wagtails, geese, and rooks), shallow-water birds (rails, sandpipers, and dabbling ducks), submerged-feeding birds (grebes, kingfishers, and diving ducks that are also found in land and water). Many aerial feeders (swallows and swifts) also showed northerly expansion. As mentioned above, terrestrial aquatic system is vulnerable to snow cover and freezing, which suggests that the mitigation of snow cover and freezing has led to a northward expansion of their range. In addition, the winter season in Japan is not suitable for aerial foragers to overwinter, as indicated by the small number of target species (4), most of which are summer residents. This trend may reflect the global warming that is expected to lead to birds with such life histories becoming able to overwinter in Japan.

Table 4. Top 10 species whose distribution (latitude + longitude values) moved northward.

Species	Median change		
	1980s	2010s	Change
Daurian Jackdaw	164.6	174.0	9.4
Rook	164.3	173.3	9.0
Ashy Minivet	158.8	166.6	7.8
Chinese Grosbeak	164.3	170.6	6.3
Ruddy-breasted Crake	162.4	168.6	6.2
Ruddy Turnstone	162.9	168.8	5.9
Barn Swallow	164.4	170.1	5.7
Japanese Quail	170.4	175.6	5.2
Temminck's Stint	165.1	169.7	4.6
Pacific Loon	175.4	179.4	4.0

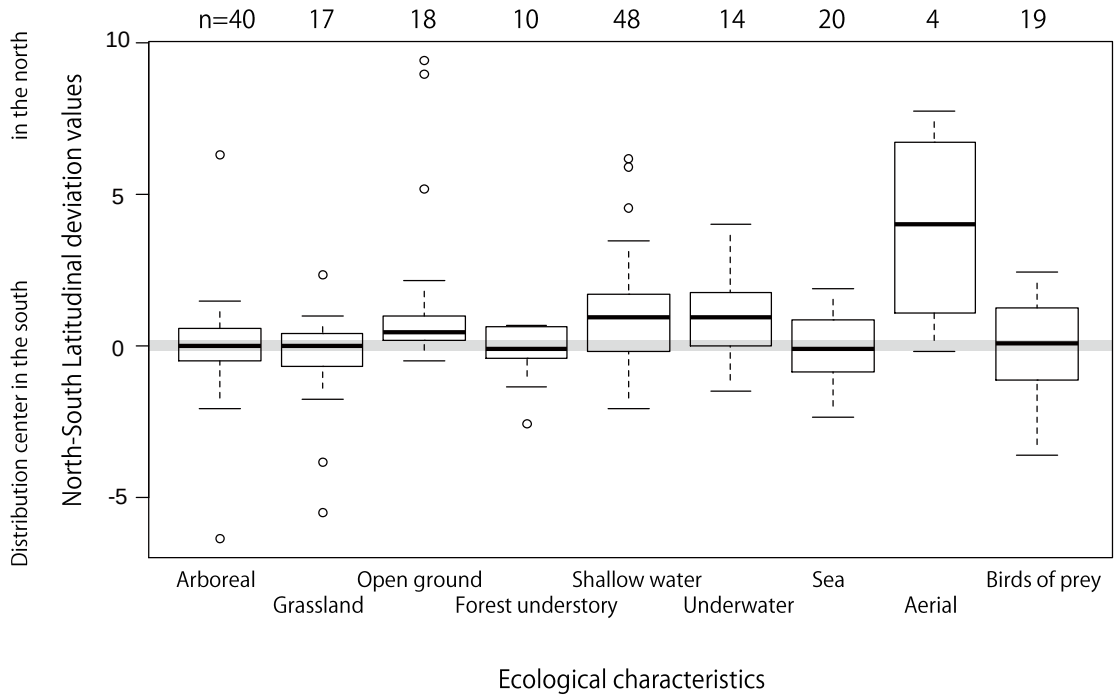


Fig. 4: Relationship between ecological characteristics and median change in range. Positive values indicate a northward shift in range. Numbers at the top of the graph indicate the number of relevant species.

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