

# **Selectivity and mesh size: an assessment of the methods used for live-capturing**

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## 1. Introduction and scope of report

Across the territory of the European Union, as elsewhere, birds are taken from the wild for a myriad of reasons. This report explores the most common methods used for capturing birds alive, ranging from passive methods like mist-nets to active set-ups such as clap-nets. It also seeks to establish which of these methods is the most selective.

## 2. The Birds Directive

**Articles 1 and 5** of the Birds Directive (Directive 2009/147/EC) require Member States to take the requisite measures to establish a general system of protection for all species of naturally occurring birds in the wild state on the European territory, prohibiting in particular:

- (a) deliberate killing or capture by any method;*
- (b) deliberate destruction of, or damage to, their nests and eggs or removal of their nests;*
- (c) taking their eggs in the wild and keeping these eggs even if empty;*
- (d) deliberate disturbance of these birds particularly during the period of breeding and rearing, in so far as disturbance would be significant having regard to the objectives of this Directive;*
- (e) keeping birds of species the hunting and capture of which is prohibited.*

**Article 8** of the Directive states that:

- 1. In respect of the hunting, capture or killing of birds under this Directive, Member States shall prohibit the use of all means, arrangements or methods used for the large-scale or non-selective capture or killing of birds or capable of causing the local disappearance of a species, in particular the use of those listed in Annex IV, point (a).*
- 2. Moreover, Member States shall prohibit any hunting from the modes of transport and under the conditions mentioned in Annex IV, point (b).*

The prohibited means listed in Annex IV(a) of the Birds Directive are as follows:

- snares (with the exception of Finland and Sweden for the capture of *Lagopus lagopus lagopus* and *Lagopus mutus* north of latitude 58° N), limes, hooks, live birds which are blind or mutilated used as decoys, tape recorders, electrocuting devices,*
- artificial light sources, mirrors, devices for illuminating targets, sighting devices for night shooting comprising an electronic image magnifier or image converter,*
- explosives,*
- nets, traps, poisoned or anaesthetic bait,*
- semi-automatic or automatic weapons with a magazine capable of holding more than two rounds of ammunition;*

**Article 9** of the Birds Directive allows Member States to derogate from the provisions of Articles 5 to 8, **where there is no other satisfactory solution**, for the following reasons:

- (a) — *in the interests of public health and safety,*
  - *in the interests of air safety,*
  - *to prevent serious damage to crops, livestock, forests, fisheries and water,*
  - *for the protection of flora and fauna;*
  
- (b) *for the purpose of research and teaching, of re-population, of re-introduction and for the breeding necessary for these purposes;*
  
- (c) *to permit, under strictly supervised conditions and on a selective basis, the capture, keeping or other judicious use of certain birds in small numbers.*

### **3. Passive methods of capture**

#### **Lime-sticks**

Lime-sticks are a **non-selective** method of capture, consisting of twigs, about 50-70cm long, which are covered in extremely sticky ‘glue’ made by boiling up the fruit of the Syrian plum-tree (Rhoads, 2009)<sup>1</sup>. These sticks are placed in bushes, or sometimes inserted into the ends of bamboo poles, to provide very inviting perches for birds. Birds that alight on lime-sticks become stuck, fall upside down, and as they flutter to free themselves become progressively more stuck. Unattended lime-sticks result in a long, lingering death. Lime-sticks and mist-nets are used, illegally, in countries where the controversial dish known as *ambelopoulia* is consumed. *Ambelopoulia* is not practiced in Malta, which explains why lime-sticks are not used. It is frowned upon not only by the general public but also by Maltese hunters and live-capturers themselves as it is considered taboo to consume passerines and non-huntable species in general. Rhoads (2009) estimates that 150 species are caught on lime-sticks, including a considerable number of species of conservation concern.

#### **Mist nets**

Mist nets are used by ornithologists and bat biologists to capture wild birds and bats for banding or other research projects. Mist nets are typically made of nylon or polyester mesh suspended between two poles, resembling a volleyball net. Mist nets are very fine-mesh nets, which are strung end-to-end to make an invisible ‘wall’ in which birds and bats<sup>2</sup> fly and become entangled. These nets may be stretched across watercourses, between trees and bushes or other areas otherwise commonly frequented by birds and bats. Since non-target species can also become entangled into these nets, such method is considered **non-selective**, which explains in part why research studies that include the capturing of wild birds, including bird-ringing, are subject to an Article 9 derogation.

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<sup>1</sup> <https://migration.wordpress.com/2009/09/28/limesticks-and-mist-nets/>

<sup>2</sup> <https://www.nhbs.com/search?q=bat+mist+nets>

## 4. Active methods of capture

### Rocket nets and cannon nets

Rocket nets and cannon nets are types of animal traps used to trap a large number of live animals, usually birds, but they also have been used to catch large animals such as various species of deer. Rocket nets, cannon nets, and other net launching devices are considered **selective** and are built upon similar principles that have been used since the 1950s (Dill and Thornsberry 1950, Hawkins *et al.* 1968, Grubb 1988 and 1991)<sup>3</sup>. Rocket and cannon nets are used in conservation programs where a large number of live animals need to be captured for analysis, veterinary care or relocation. This method is rarely, if ever, used in Malta.

Cannon nets are similar to rocket nets except cannon net has a heavy metal barrel fired from a launch-rod attached to a metal plate. A full-sized cannon net may utilise four or more cannons to pull the net over the target birds. Smaller nets with fewer cannons are also used. The rocket net or similar-looking item is placed at the target location days or even weeks in advance to allow animals to become accustomed to its presence. When cannon-netting is carried out for the purpose of catching large numbers of waders or shorebirds for banding and release, it requires an experienced team to coordinate and manage not only the catch itself, but also the subsequent care and processing of the birds to their eventual safe release.

Catching is usually conducted on tidal beaches or adjacent to coastal mudflats, although occasionally other locations, such as salt lakes or sewage treatment lagoons, are used. Consideration of expected maximum tide height and wind direction may affect the precise placement of the net. If the birds do not fly or walk readily into the catching area of the net when coming in to roost, it may be necessary, through the judicious placement and movement of people or vehicles, to encourage the birds to move into position where they can be safely caught. Team members coordinate their efforts through radio contact.

The net is fired when it is judged that an appropriate number of birds is catchable, and that none will be endangered during firing. The number of birds caught should not exceed the capacity of the team to deal with them expeditiously. The birds are extracted as speedily as possible from the net and placed in temporary fabric holding cages to await processing in a sheltered environment to minimise stress to the birds. Over the years, biologists have modified this basic set up to catch various animals (Schemnitz *et al.* 2012)<sup>4</sup>. Portable platforms have

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<sup>3</sup> Dill, H. S., and W. H. Thornsberry. 1950. *A cannon-projected net trap for capturing waterfowl*. Journal of Wildlife Management 14:132-137.

Grubb, Teryl G. 1988. *A portable rocket-net system for capturing wildlife*. Research Note RM-484. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Grubb, T. G. 1991. *Modifications of the portable rocket-net capture system to improve performance*. USDA Forest Service Rocky Mountain Forest and Range Experiment Station. Research Note RM-502.

Hawkins, R. E., L. D. Martoglio, and G. G. Montgomery. 1968. *Cannon-netting deer*. Journal of Wildlife Management 32:191-195.

<sup>4</sup> Schemnitz, S. D., G. R. Batcheller, M. J. Lovallo, H. B. White, and M. W. Fall. 2012. *Capturing and handling wild animals*. Pages 64–117 in N. Silvy, Editor. Wildlife Techniques Manual: Volume 1 – Research (7th Edition). Johns Hopkins University Press, Baltimore, MD.

been built to capture birds over open water. Rocket nets have also been fired from portable platforms to capture birds in water (Heath & Frederick, 2003)<sup>5</sup>.

## **Clap-nets**

The clap-net system, sometimes referred to as whoosh net, is an active method of capture, as it requires the constant presence of specialized personnel. Birds cannot be caught unless the operator manually activates the contraption and, in particular, knows when to activate it, as explained below. The clap-net system consists of two parallel nets (known as a clap-net pair) spread flat on the ground linked to a central rope or chord that is used by the operator to pull and thus trigger the contraption. When activated, the nets initially launch rapidly from the ground and fold softly over each other over the capture zone. It can only operate successfully if all the various components are in place and work in tandem—an operator, proper functioning apparatus, pulling equipment, nets with the right mesh-size and good calling lure-birds/live-decoys (including ‘seesaw’ perch/fluttering decoy) of the species intended to be caught (target species). Failure to have one of these components in place renders the clap-net system useless. The different yet interlinked components are summarised below.

- i) **The operator**  
The operator must have sound bird identification skills, the ability to “understand” the birds’ movements, flight patterns and various types of intra- and inter-specific calls. These skills are obtained after years of experience. For example, without knowledge of cues provided by live-decoys, the operator would not be able to operate and manage the clap-net system, including crucial timing of when to activate the seesaw perch (see Section 6), which is in turn essential if the birds are to alight within the footprint area of the clap-net pair. Indeed, if the seesaw perch is not activated at the right time (too early or too late), the target bird will simply fly away.
- ii) **The apparatus**  
The nets, poles, strings, ropes and live-decoys must “work” in tandem in order to have an effective clap-net system. The area of the clap-net is also important in order to achieve the intended result—in densely wooded areas without clearing, a clap-net pair cannot be properly set up and is hence more appropriate for sparsely wooded and open terrain.
- iii) **The live-decoy**  
Live-decoys are strategically placed to attract conspecifics—without them, migratory birds would not alight within the footprint area of the clap-net pair, as they would not have had time to get accustomed to the nets. Good quality live-decoys (call-birds) also provide important cues to the operator on whether or not conspecifics are approaching or present within the area. The best live-decoys will change their calls whenever they see or hear conspecifics and it is this change in calls that alerts the operator (see Section 6).

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<sup>5</sup> Heath, J. A., & Frederick, P. C. (2003). *Trapping White Ibises with rocket nets and mist nets in the Florida Everglades*. *Journal of Field Ornithology*, 74(2), 187–192. doi:10.1648/0273-8570-74.2.187

## How *selective* are clap-nets?

The European Commission and the Court of Justice of the European Union declare clap-nets as non-selective means of capture because they can catch other birds. Although invariably a clap-net is the **most selective method of capture** when compared with other methods, such as mist-nets or lime-sticks, can it objectively be considered selective and, if so, to what *extent*? Livingstone<sup>6</sup> (2012: 91) notes that “*The clap-net...is set in motion by a person watching it, who thus has the opportunity of leaving alone any birds that come within its range, and are not suited for his purpose.*” This implies that there has to be an intent from the part of the person watching the clap-net (the operator) to capture non-target species. In turn, non-target species cannot be caught by means of a clap-net *unless* the operator resorts to illegal methods for attracting the birds such as live-decoys and/or pre-recorded bird calls of non-target species. This assertion is also attested by Birdlife Malta (2017)<sup>7</sup>: “*A trapping site **can only operate** if it uses other birds to attract their wild counterparts*” (emphasis added). The need to resort to illegal means (live-decoys of non-target species or pre-recorded bird calls) implies that non-target species cannot be caught using live-decoys of (permitted) target species or by having a clap-net set up in the first place. Indeed, a clap-net without live-decoys (or pre-recorded bird calls) is useless for catching birds, unlike other methods outlined above. Resorting to illegal means for capturing non-target species does not render the clap-net a non-selective method of capture. The clap-net system is thus considered to be **structurally and inherently selective**.

## 5. Mesh size of nets and shoulder widths

### Mesh size measurement and material

There are different methods for measuring mesh size (Figure 1). Avinet<sup>8</sup> notes that the mesh size is the designation of the size of the opening in a given net and defined as one-half of the perimeter of one of the mesh squares of the net. This distance can best be measured by stretching a mesh square, measuring one of the four sides, and multiplying by 2 to determine the designated mesh size. If, for example, one side of the mesh square reads as 18mm, then the mesh size is 36mm (18mm x 2).

A simpler method is adopted by the Natural History Book Service (NHBS)<sup>9</sup>, which defines mesh size as measured by one side of the square mesh, so that, for example, “16mm” (length of mesh side) refers to a 16 x 16mm square mesh. According to NHBS, the mesh size should be suited to the chosen target species—if the mesh size is too small, the bat or bird may escape and if the mesh size is too large, the bat or bird may become overly entangled in the net. NHBS recommends a mesh size for small birds ranging from 14mm (14 x 14mm) to 19mm (19 x 19mm) mesh and a mesh size for medium-sized birds ranging from 19mm (19 x 19mm) up to 30mm (30 x 30mm)<sup>10</sup>. The standard measurement for mesh size applies for mist nets and other types of nets.

Mist-nets are exclusively fabricated from nylon and polyester, whilst the preferred material for clap-nets is cotton, which is a much safer alternative. Birds caught using cotton fabric are unharmed and easily released. Nylon and polyester mist-nets have long been known to cause

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<sup>6</sup> Livingstone, E. H. (Ed) (2012). *The Trapper's Bible*. Skyhorse Publishing: USA (p.91)

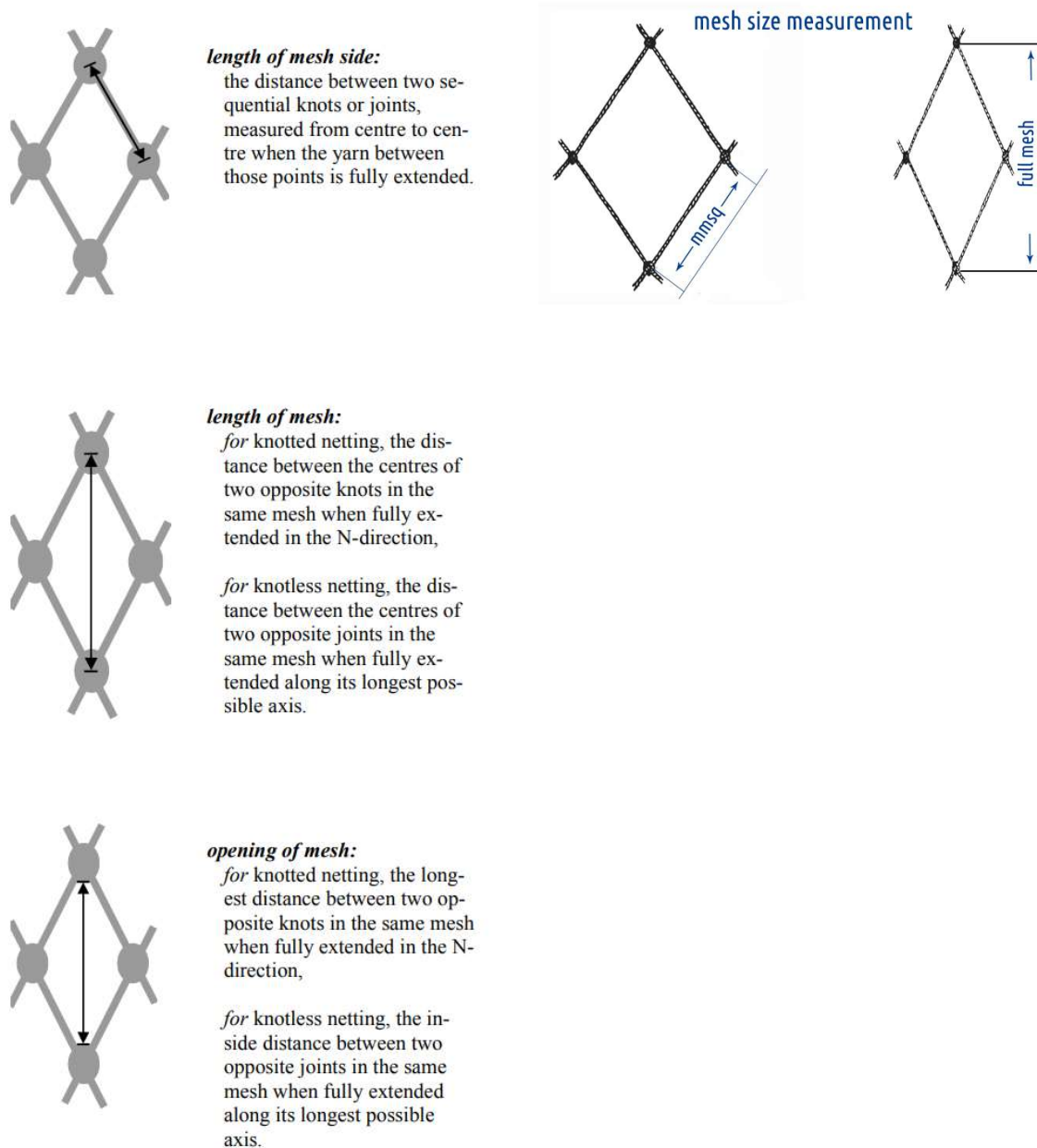
<sup>7</sup> <https://youtu.be/FSSlrjKNLA8?t=44>

<sup>8</sup> <https://www.avinet.com/pages/mist-nets>

<sup>9</sup> <https://blog.nhbs.com/how-to-guides/guide-to-mist-nets/>

<sup>10</sup> <https://www.nhbs.com/>

internal and external injuries and mortality to birds (Silvy & Robel, 1968<sup>11</sup>, Spotswood *et al.*, 2012<sup>12</sup>).



**Figure 1:** Methods used for measuring mesh size.

Source: Fonteyne and Galbraith (eds.) (2004): *Mesh size measurement revisited*. Available at: [www.vliz.be/imisdocs/publications/257002.pdf](http://www.vliz.be/imisdocs/publications/257002.pdf)

<sup>11</sup> Silvy, N. J., & Robel, R. J. (1968). *Mist nets and cannon nets compared for capturing prairie chickens on booming grounds*. The Journal of Wildlife Management, 32(1), 175. doi:10.2307/3798252

<sup>12</sup> Spotswood EN, Goodman KR, Carlisle J, Cormier RL, Humple DL, Rousseau J, Guers SL and Barton GG (2012). *How safe is mist netting? evaluating the risk of injury and mortality to birds*. Methods in Ecology and Evolution. Vol. 3:29–38. British Ecological Society. Available at: <https://besjournals.onlinelibrary.wiley.com/doi/epdf/10.1111/j.2041-210X.2011.00123.x>

## Mesh size and shoulder widths of nine species

The following table lists the minimum and maximum shoulder widths of nine species for comparison. All measurements were taken from skinned birds for taxidermy (body without skin and feathers) by the president of the Malta Taxidermy Federation from specimens at Worldfauna taxidermy company in Denmark and at l'Arche de Noé in Vicques, Switzerland.

Species – English name	Species – Taxonomic name	Total specimens measured	Measurements minimum–maximum (mean)	Minimum Mesh size (square mesh)	
				Single-species	Multi-species
European Golden Plover	<i>Pluvialis apricaria</i>	38	52.5mm–58.5mm (55.6mm)	45 x 45mm	34 x 34mm
Song Thrush	<i>Turdus philomelos</i>	46	34.5mm–36mm (35.7mm)	34 x 34mm <sup>13</sup>	
Hawfinch	<i>Coccothraustes coccothraustes</i>	25	32mm–33.5mm (32.1mm)		
European Greenfinch	<i>Chloris chloris</i>	29	26mm–27mm (26.9mm)		
Common Chaffinch	<i>Fringilla coelebs</i>	42	24mm–25mm (24.8mm)		
Eurasian Linnet	<i>Linaria cannabina</i>	23	22mm–23mm (22.9mm)		
European Goldfinch	<i>Carduelis carduelis</i>	18	21mm–22mm (21.5mm)		
Eurasian Siskin	<i>Spinus spinus</i>	39	19.4mm–20.5mm (19.6mm)		
European Serin	<i>Serinus serinus</i>	35	18.5mm–19.5mm (18.7mm)		

Source: M. Buhagiar, unpub. data, 2019.

Based on these shoulder widths, the recommended mesh size for Song Thrush is 34mm x 34mm. Notwithstanding the issues discussed in Section 4 and 6 on selectivity, since the recommended mesh size is based on the **minimum** shoulder width, in the event that nets with the recommended mesh size are not commercially available or manufactured, the next available *larger* mesh size (e.g. 35mm x 35mm for Song Thrush) should be used to ensure that the other species would invariably pass through the nets even if there is an (illegal) attempt at catching them.

<sup>13</sup> In Infringement 2009-4106, the European Commission had questioned why the Maltese authorities did not increase the mesh-size for live-capturing of Golden Plover and Song Thrush from 30 x 30mm to 45 x 45mm, based on comparisons by the Natural History Museum of London of the shoulder width of Song Thrush skeletons. The mesh size was subsequently increased to 45 x 45mm via [L.N. 333/2018](#), but it transpired that it was too wide for Song Thrush.

## 6. Live-decoys and selectivity

Whilst the use of live-decoys for mist-nets is not essential—given that birds (or bats) simply fly into the net—the clap-net system invariably requires the use of live-decoys in order to attract their conspecifics to a designated area. It should be noted that the Court of Justice of the European Union had confirmed, in case C-182/02, that the use of live-decoys can constitute a judicious use:

“...*the hunting of wild birds for recreational purposes during the periods mentioned in Article 7(4) of the Directive may constitute a judicious use authorised by Article 9(1)(c) of that directive, as do the capture and sale of wild birds even outside the hunting season with a view to keeping them for use as live decoys or to using them for recreational purposes in fairs and markets [emphasis added] (see Case 262/85 Commission v Italy [1987] ECR 3073, paragraph 38)*”.

With the clap-net system, a specimen from the target species can only be directed to settle in a specific patch exclusively by the use of conspecific live-decoys consisting of call birds and flutter-decoys. A flutter-decoy is held on what is known as a seesaw perch (arboreal species only) by means of a harness made of cotton string and swivel. The size of a harness is species-specific. Bub (1978)<sup>14</sup> notes that harnesses do not affect the bird’s demeanour as attested by their normal preening and foraging behaviour.

According to Bub (1978) and traditional knowledge, birds from the same species vary in their ability to ‘qualify’ as good quality call birds. Conversely, not all live-decoys ‘qualify’ as good quality flutter-decoys. Some birds will not manage to alight on the seesaw perch, but those that do will use it as any other natural perch by flying onto it when lifted up by the operator. It is not the *amount* of live-decoys that really count but rather the *quality* of live-decoys.

The only alternative to live-decoys is the use of pre-recorded bird calls, but only partly—pre-recorded bird calls cannot provide the operator the cues from live-decoys and do not in any event replace the flutter-decoy. In Maltese, the saying “*it-taħrik huwa nofs il-qbid*” attests the important role that a seesaw perch has in the entire clap-net system. Live-decoys (call birds and flutter-decoys) are in turn a testimony that the clap-net system is **structurally selective** since without them the operator would not be able to attract conspecifics to the clap-net area, let alone catch any.

## 7. Conclusion

This report assessed the various methods used to capture birds alive and determined which method is the most selective. Passive methods of capture, such as mist-nets, are the least selective. Clap-nets, on the other hand, are the most selective active method of capture due to their total dependency on the use of live-decoys of target species and due to their inextricably-linked complex set of components that must work in tandem for the system to work. Should any one of the components be missing, the entire clap-net system would be rendered useless. It has been shown that without the use of live-decoys—or pre-recorded bird calls, which are in

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<sup>14</sup> Bub H. (1978). *Bird trapping and bird banding: a handbook for trapping methods all over the world*. Cornwell University Press.

any event illegal to use/possess during live-capturing—the operator would not be able to attract conspecifics to the clap-net area. The clap-net system is thus considered to be structurally and inherently selective.

Based on the shoulder width of nine species measured from two collections in Denmark and Switzerland, the recommended mesh size for finches is 18 x 18mm for multiple-species Article 9 derogations. The report also provides separate mesh sizes for single-species derogations. It has been shown that the recommended mesh size for Song Thrush is 34 x 34mm and 52 x 52mm for European Golden Plover. Specimens pertaining to these nine species would escape through nets having larger mesh sizes than those recommended.