



Keith Holmes



Keith Holmes is Manager of Koi Water Barn and has been with the company for over 10 years. During this time he has co-written numerous books and has also had articles published in the aquatic press worldwide.

SURVIVING WINTER

As winter sets in, **Keith Holmes** reveals his top tips on how to make sure your pond and Koi survive through the season, including in-depth information on heating, covering your pond and feeding your Koi...

Not every Koi keeper heats their pond and, with increasing fuel costs, it is becoming more of a considered option. However, there are numerous benefits to pond heating, and with the price of more efficient methods of heating, like heat pumps, falling rapidly, I still think it is one of the most important pieces of equipment to add to a Koi pond, after a suitable filtration system.

Heating or no heating?

One of the main reasons for heating is that over the winter months, the water temperature

in an unheated pond will fall below the level at which a Koi's immune system will function. You will find that as the temperature starts to fall below 13–14°C (56–57°F), a Koi's immune system will gradually start to shut down, and its ability to fight off any parasites or other infections reduces. This situation is only worsened by the fact that many of the things which will attack your Koi, such as parasites, remain active until much lower temperatures. So by heating, you can control the temperature in your pond and keep the water temperature out of this danger zone.

Not every Koi keeper feels that heating a pond is natural, as wild carp do experience both a winter and a summer period. This is true, although it is worth remembering that the Koi in your pond have probably been raised in mud ponds during the summer and then brought into concrete heated ponds for the winter, and so will not have experienced the sort of temperatures that we have in the UK. For Koi that fit into

Heat exchangers, like this one, are basically central-heating systems for your Koi pond





Waterfalls and venturis must be switched off during the winter if you have an unheated pond



Elegro heaters, like many used by Koi keepers, were originally designed for use in swimming pools



Heat pumps have recently fallen in price and are now an affordable option for a Koi keeper

this category, heating is a more natural approach.

In my opinion, the only instance when you might want to consider 'overwintering' your Koi (giving your Koi a winter without heating), is if you're breeding Koi, as this colder spell will help the reabsorption of eggs, and the generation of new eggs, ready for the breeding season.

Overwintering is also helpful if you want to improve your Koi's body shape, as Koi will use up their fat reserves in the colder temperatures. However, you can also achieve this with a period of reduced feeding (I would suggest a time period of one or two months) and a consistent temperature of around 13–14°C.

Ideal temperatures

If you do decide to heat your pond, there are no real hard-and-fast rules as to what is right and wrong, as a lot depends on the reasons you've chosen to heat your pond in the first place, be it health reasons, enjoying your Koi in the winter, or improving growth. As a guide, the following

temperatures are a good indication for you to follow:

January	14–15°C (58°F)
February	14–15°C (58°F)
March	14–15°C (58°F)
April	18–19°C (65°F)
May	18–19°C (65°F)
June	21–22°C (70°F)
July	21–22°C (70°F)
August	21–22°C (70°F)
September	18–19°C (65°F)
October	14–15°C (58°F)
November	14–15°C (58°F)
December	14–15°C (58°F)

Heat exchangers

Heat exchangers are perhaps one of the most common methods of pond heating and the easiest way to describe them is as central-heating systems for your pond.

Basically, a boiler has to be installed by a suitably skilled tradesman. This boiler can be fired by any means but typically by gas or oil, although in some cases a converted boiler may be installed to run off bottled gas (LPG).

This boiler is then used to pump hot water through a heat exchanger. There are usually two styles of heat exchangers – a unit that is submerged into a pond or filter and exchanges the heat directly into a pond via the water flowing around the unit, or an inline unit through which water is pumped – coming into contact with the hot water from the boiler results in the exchange of heat. The temperature is controlled via a separate thermostat unit which is used to fire up the boiler when the temperature falls below a set point. Many Koi keepers choose this method of heating due to the lower running costs compared to gas, but it must be said that there are the added installation costs on top of that. Having a boiler installed typically costs in the region of £1,500 – quite a large sum to pay out.

Inline electric heaters

For ponds of 3,000 gallons and below, inline electric heating is still popular despite the increased running costs of ▶

PREPARING YOUR POND

- 1 With increasing fuel prices, invest in a good pond cover and ensure that all your pipework is insulated.
- 2 If you're planning a new pond, insulate the walls during building.
- 3 If your pond is covered, be sure to slope the cover so that it overlaps the pond. This will allow for any condensation to fall out of the pond, as it can be high in ammonia.
- 4 If you already heat your pond, and are reducing the temperature for the winter months, do this slowly at 1°C every two or three days.
- 5 Install your heating system in the summer, so you can preserve the heat in the pond – heating a cold pond is expensive.
- 6 If you are using gas or electricity, choose the cheapest tariff.
- 7 Before fitting a heater, work out the running costs. You won't get a shock when the first bill comes!
- 8 Even in a heated pond, your Koi will benefit from a period of lower protein food at a reduced level.
- 9 If you are going to overwinter your Koi, coincide old weather reports with the coldest months of the year to help reduce heating bills.
- 10 Check your thermostat if your heater is struggling to maintain the set temperature.

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Some hobbyists see value in giving their Koi an overwintering period where any heat is switched off



Choose your pond cover carefully – spending a bit more money will give you better options

► using this style of heater. This is due to the fact that units of 3kW and below can be plugged into a three-pin plug, while units of 4kW and above have to be wired directly to the consumer unit and so require installation via a qualified electrician. It must be said, though, that if you're in doubt about anything, you should always consult a qualified electrician first. As a rule of thumb, you must allow 1kW of electricity for every 1,000 gallons of pond water.

These units work as the name suggests, by pumping the water through a unit which houses an electrical heating element. The units themselves house a thermostat, which can control the exact heating temperature of a pond. To help reduce running costs, many people will opt for a unit with a built-in timer so that they can take advantage of cheaper electrical tariffs like Economy 7. The problem with this is that the pond may lose 2–3°C of

heat in the day, which means that your Koi are still subject to temperature fluctuations. It is critical, therefore, that you monitor the daytime temperature and program the heater to come on in the day for a short time, if the temperature falls.

Electric heat pumps

Electric heat pumps have been around for some time, but it is only in the past year or so that they have become a viable option for a Koi pond as they have fallen in price. Despite this, they are still a serious outlay; prices can often cost in the region of £1,000 for a small unit, and many thousands for a bigger unit.

If you do opt for this method of heating, remember that you won't save any money until the second year of using it – but from then onwards you should save some 75% on running costs compared to conventional electric heating, and up to 50% compared to gas.

Heat pumps work without actually generating any heat themselves. Instead, they work like a reverse-cycle air conditioner, heating water instead of cooling air. Due to this, many units can in fact operate as both a heater and a cooler. Heat is absorbed from the ambient air; it is then amplified via the compressor and transferred to the water via the heat exchanger. This makes heat pumps very efficient, as an output of say 8kW of power can be achieved with as little as 1.8kW of actual power consumption. The problem is that these units rely upon the ambient heat in the air, so in the colder months of the year they are not able to heat the water like a correctly sized heat exchanger or traditional inline electric heater. Because of this, I'd suggest that you cover your pond as well. Some people are even installing a heat pump indoors, in a shed, greenhouse, conservatory or other outbuilding so that the

air that is passing through the unit has a higher temperature than outside. If you choose to do this, it is vital that the exhaust air be expelled into the atmosphere and not into the building, as it can be very cold once it has had all the heat extracted from it.

Heat pumps are ideal for those who do not want to have higher temperatures all-year round as they allow for very cheap heating for around 6–8 months of the year. However, not all heat pumps work on the heat in the air – some work off geothermal heat found in the ground. Geothermal heat pumps are a very green way of heating (many new-build housing developments are looking into this type of free energy) but very expensive to install, and not really a viable option for Koi ponds.

Winter feeding

As the temperature drops you will need to consider changing the food you give to your Koi,

WEIGHING UP YOUR HEATING OPTIONS

TYPE OF HEATER	DISADVANTAGES	ADVANTAGES	COST
Heat pump	<ul style="list-style-type: none"> Initial outlay can be a lot compared to other forms of heating May have a limited ability to heat to any real degree in the winter, so not use to people keeping at 16°C all year unless pond is installed in a building Size of the unit may limit the installation for some people 	<ul style="list-style-type: none"> Running costs 75% cheaper than conventional electric, and up to 50% cheaper than gas, which soon offsets the high initial price Very easy to install, in most cases can be fitted by a hobbyist Many units can cool as well as heat, which is ideal for KHV temperature cycling 	£1,000–10,000
Heat exchanger	<ul style="list-style-type: none"> Needs to run off a gas, oil or LPG boiler so there will be associated charges in getting this installed 	<ul style="list-style-type: none"> Tried and tested system which has been in place for 30 years If the correct-sized components are purchased you can heat to 30°C all year round 	£200–300 for the unit, upwards of £1,000 to install the boiler
Inline electricity	<ul style="list-style-type: none"> Very expensive to run Any units above 3kW needs to be hard-wired directly back to the fuse panel by a qualified electrician 	<ul style="list-style-type: none"> Small unit Very easy to install and units 3kW or less can be run straight from a three-pin plug Low initial purchase price 	£100–500
300W in-tank heater	<ul style="list-style-type: none"> Only for use in very small quarantine systems Not a very accurate means of temperature control 	<ul style="list-style-type: none"> Cheap and easy way to heat a quarantine tank or small tank 	£15–30
Geothermal heat pump	<ul style="list-style-type: none"> Initial installation can be very expensive Will need a lot of room to install it Will need to employ a specialist company to install 	<ul style="list-style-type: none"> Once installed it is virtually heating for free Good for people who have a green conscience 	Expect to pay £10,000s

There are other methods of heating available, such as solar heating, but I believe that these five are the most common used by Koi keepers. Although I have not mentioned any manufacturers, further information about where to purchase these units can be found easily on the Internet.

and at water temperatures of 9–14°C (48–57°F) you should ideally be feeding your Koi a wheatgerm-based diet. As the water temperature in the pond decreases, your Koi's metabolism decreases and, with this, so does their ability to process any food. This makes a wheatgerm-based diet an ideal feed for this time of year, as it is low in protein, easily digestible, and your Koi can still process it even at these lower temperatures. If you feed your Koi a food with a high protein value, there is a risk that the food will not be processed, and this may cause internal problems in your Koi.

Many of the foods which are offered for sale now as staple diets for Koi are suitable for year-round feeding; there is no need to change over to a wheatgerm-based diet if you're using such a food. Even if you heat your pond, it is still a good idea to give your Koi a month or two on a wheatgerm-based food. This will allow them to use up any

fat reserves acquired over the summer, which in turn will help maintain a good body shape and avoid 'fat' Koi.

Many Koi keepers will also choose to feed a sinking food at this time of year due to the reluctance of the Koi to come to the surface to feed in lower water temperatures. At temperatures of below 9°C (48°F) it is best to restrain from feeding your Koi, even on sunny days when they may venture up to the surface to look for food. In an unheated pond, it is best to stop feeding once temperatures fall below 9°C (48°F) and not start feeding again until water temperatures raise above that, and are likely to stay above this. A classic temptation for a Koi keeper is to go out in late February on a sunny day and see the Koi looking for food and start feeding, only to find that, after a hard frost the next day, the pond temperature has fallen again. I recommend waiting until the pond temperature stays above 9°C (48°F).

Keeping costs down

With the popularity in pond heating, more and more people cover their ponds to help prevent heat loss, as a good cover alone can help keep temperatures 1–2°C higher than in an uncovered pond. Bubble wrap is a popular choice when covering your pond to help maintain heat, and can either be laid directly onto the pond surface or placed on a frame. There are numerous types of bubble wrap available, from the type used in greenhouses, which is relatively cheap, to the blue

swimming-pool covers which offer the best heat retention but at a higher cost. If you opt to use standard bubble wrap, you must use a UV-suitable type, as otherwise it will simply fall apart after time. If you use a frame, ensure that it is slightly sloping and has an overlap on the pond, to help prevent condensation from falling back into the pond, as this may contain high levels of ammonia and nitrite.

You could also use polycarbonate to construct a more substantial pond cover. It is available in numerous 'wall' thicknesses (the more 'walls' you have the better the installation) but, as a general rule of thumb, ▶



Feed your Koi a low-protein food, at reduced levels, for a short period every year – whether you heat the pond or not

INSTANT EXPERT HOW TO

THE HEAT IS ON Keith Holmes asked a handful of his clients about their experiences with pond heating – including how much it costs them to heat their ponds...



NAME: FRANK COLLINS

HOW BIG IS YOUR POND?
10,000 gallons.

HOW DO YOU HEAT YOUR POND AND WHY?
I heat my pond by oil as I am not on gas where I live. The pond has its own boiler which heats two large heat exchangers. I was losing big fish each spring so, bearing in mind the value of a big Koi, it was better to heat.

WHAT ARE THE MAIN BENEFITS TO POND HEATING?
If you heat all year, you can treat health problems with better results as the fish's immune system is still active. You can also enjoy your fish for 12 months.

HOW MUCH DOES IT COST TO HEAT YOUR POND?
It costs next to nothing for seven months of the year, then the winter comes. I then get through a tank of oil every six weeks at a cost of £700.

WHAT TEMPERATURE WILL YOU KEEP YOUR POND AT THROUGHOUT THE YEAR?
The best temperature is 22°C for those spring/summer months, dropping down to 18°C in the winter. If there is a health problem at 18°C, I increase it to 22°C.

DO YOU TAKE ANY STEPS TO REDUCE YOUR COSTS IN THE COLDEST MONTHS?
In the coldest months, I use a pool cover suspended off the water.

WHAT IS YOUR ADVICE ON HEATING TO OTHERS?
Weigh up the benefits for yourself and then ask yourself, do I want to lose fish? With fish costing vast amounts of money I would not want to lose another one.



NAME: JIM LITCHFIELD

HOW BIG IS YOUR POND?
3,500 gallons.

WHEN DID YOU DECIDE TO HEAT YOUR POND?
About five years ago.

HOW DO YOU HEAT YOUR POND?
With a 3kW inline electric heater – I started heating to help my Koi survive through the winter.

WHAT ARE THE MAIN BENEFITS TO POND HEATING?
Simply improved health!

HOW MUCH DOES IT COST TO HEAT YOUR POND?
I have to say not a lot, but I've not kept a check on it.

WHAT TEMPERATURE WILL YOU KEEP YOUR POND AT THROUGHOUT THE YEAR?
The main reason I heat is to restrict the fluctuations in temperature and so I do not have a set summer or winter temperature – I adjust with the weather. I do, however, ensure that it goes no lower than 8°C in the winter.

DO YOU TAKE ANY STEPS TO REDUCE YOUR COSTS IN THE COLDEST MONTHS?
In the winter I cover the pond with polycarbonate sheeting.

WHAT IS YOUR ADVICE ON HEATING TO OTHERS?
Ensure that your pond, as well as pumps, UV units and pipework, are insulated.

► twin or triple thickness is normally more than sufficient for a pond.

The step up from this is to construct a polytunnel or greenhouse structure over the whole pond. Obviously this is not for everyone, but it will allow a mini environment to be created around the pond. It is important to ensure that, whatever method you use, you can get access to your pond for feeding and maintenance and, if possible, try to uncover a

small section of the pond at least every day to allow air circulation, and to let any gases that may have built up escape.

If you do cover your pond, make sure that you do some homework into the materials that you will use, be it netting, bubble wrap or plastic. Ensure that any exposed pipework is lagged and filters and equipment like pumps and UV units are also suitably insulated. For those of you lucky enough to be in the building stages, you can actually insulate

the sides of a pond before you apply a waterproof lining.

As with any material being used around a pond that may come into contact with the water, be sure to check that it does not contain any toxic chemicals that may leach out and affect the health of your fish. Make sure that your chosen cover is secure and will stand up to any adverse weather conditions, as the last thing you want to find is that your cover was blown from the pond, and in the process damaged

the fish within and the actual pond in itself.

Increased efficiency

Whether your pond is heated or not, it is a good idea to ensure that your filters are running efficiently and are free from waste. Any waste within your filtration setup can act as a home for both parasites and bacteria, and it is better to remove this waste before going into winter. Ideally, any work you want to



NAME: TIM FISHER

HOW BIG IS YOUR POND?
4,000 gallons.

WHEN DID YOU DECIDE TO HEAT YOUR POND?
In 2003.

HOW DO YOU HEAT YOUR POND AND WHY?
I use a gas boiler with heat exchangers. I heat my pond to improve the health of my Koi, and I was getting fed up with them sitting on the bottom of the pond over winter!

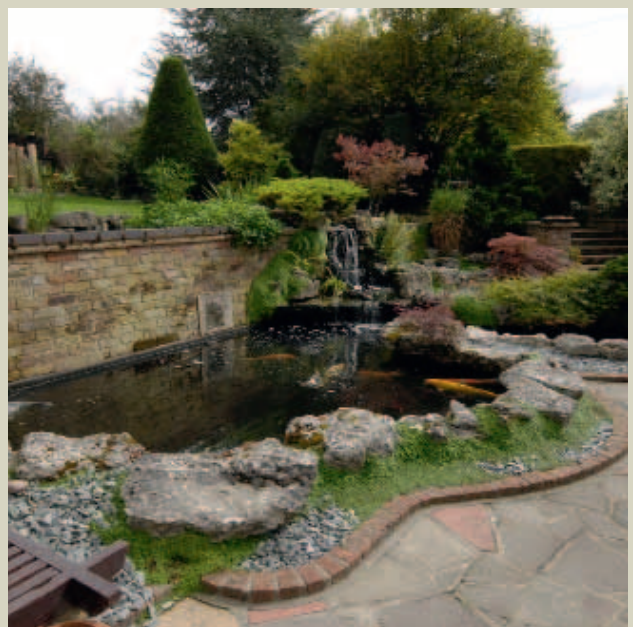
WHAT ARE THE MAIN BENEFITS TO POND HEATING?
To help improve the health of the Koi, and get improved rates of growth. It also helps to keep the filters functioning effectively over the winter months.

HOW MUCH DOES IT COST TO HEAT YOUR POND?
I have no idea!

WHAT TEMPERATURE WILL YOU KEEP YOUR POND AT THROUGHOUT THE YEAR?
In the summer I will keep it at around 23°C, in the winter I will maintain 15°C.

DO YOU TAKE ANY STEPS TO REDUCE YOUR COSTS IN THE COLDEST MONTHS?
I cover the pond in the coldest months with polycarbonate.

WHAT IS YOUR ADVICE ON HEATING TO OTHERS?
Heat as much as you can afford!



NAME: ERIC MARSDEN

HOW BIG IS YOUR POND?
3,500 gallons.

WHEN DID YOU DECIDE TO HEAT YOUR POND?
I do not heat my pond as I cannot afford it.

HOW DO YOU HEAT YOUR POND?
I do not heat my main pond, I do however heat my two small 500 gallon ponds using 300W aquarium heaters.

WHAT ARE THE MAIN BENEFITS TO POND HEATING?
Over the years I have lost a couple of Koi in my main pond due to the cold weather, but I never get problems in the two smaller pond

WHAT TEMPERATURE WILL YOU KEEP YOUR POND AT THROUGHOUT THE YEAR?
The warmest the pond has been is 72°F in the summer, but in the winter, as it is not heated, I can recall it going down to 35°F, which the Koi did not like.

DO YOU TAKE ANY STEPS TO REDUCE YOUR COSTS IN THE COLDEST MONTHS?
Yes, I put a sheet cover over the pond, filters, pumps and UV unit, I then turn the river section and waterfall off.

WHAT IS YOUR ADVICE ON HEATING TO OTHERS?
Believe me, I would heat my main pond if I could afford it. I always get problems in my main pond but never in the heated smaller ponds, which speaks for itself.

carry out on the filters should be done well in advance of the decrease in water temperature. You can then safely add a filter-boosting product to help recolonise any beneficial bacteria lost during the cleaning process. Late September is an ideal time to be doing this, as your filters should not be turned off over the winter, whether you're heating or not.

If your pond is unheated, you should look at turning off your water features, waterfalls

and venturis once the water temperature falls to 10–14°C, as all these will be doing is pulling cold air into the pond and lowering the water temperature even quicker. If you can't turn these off, then install suitable pipework so that the pond water is flowing through it and then returned to the pond below the water level to prevent splashing, which has the effect of lowering water temperature. If your pond is heated it is vital that waterfalls be turned off as already

described. As winter passes and spring arrives, bringing with it improved water temperatures, you can turn your waterfall and venturis back on, as well as remove your pond covers.

You can leave your air pumps running, especially if they are housed in a filter chamber as, this way, they will not be pulling in cold air. There is also a school of thought that, as air pumps themselves generate a certain amount of heat, the amount of chilling from an air pump is

minimal – the air that is being pumped is not cold. The benefits of leaving air pumps running certainly outweigh the savings by turning them off. At the same time as this, it is advisable to start increasing the heating temperature to ensure that there are no fluctuations in temperature caused by the pond water rising on a hot sunny day, but dropping on a cold night. Once again, any increase should be made slowly at the rate of a 1°C every two or three days. ■