



FEED ^{THE} FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

Complementary Food for Africa+Dried Fish Powder Recipes



USAID
FROM THE AMERICAN PEOPLE



WorldFish



MISSISSIPPI STATE UNIVERSITY™
GLOBAL CENTER FOR AQUATIC
HEALTH AND FOOD SECURITY



Fish powder
Oreochromis spp.
Bream (Raw)

Fish powder
Oreochromis spp.
Bream (Smoked)

Fish powder
Limnothrissa spp
Kapenta

Fish powder
Oreochromis spp.
Bream (Raw)

Fish powder
Oreochromis spp.
Bream

Foreword

The consumption of pelagic whole small fish during the first 1,000 days of life—which is the period of time from conception until a child reaches two years of age—is associated with optimized health, nutrition, and cognitive development among infants and young children as well as with reduced stunting and anemia. Pelagic whole small fish are a protein-rich and nutrient-rich animal source food that is popular in Zambia and across sub-Saharan Africa. Because they are consumed whole, pelagic small fish are rich in more than 15 micronutrients such as calcium, vitamin A, iron and zinc, all of which play important roles in infants' and young children's cognitive and physical development.

The Government of Zambia is promoting the consumption of nutrient-dense foods—including dried fish powder combined with other locally sourced, seasonally available, nutrient-dense powders made from, for example, orange-fleshed sweet potato, dark green leafy vegetables (e.g., dried pumpkin leaves), groundnut, soybean, and cassava. In addition to being used to fortify complementary foods for vulnerable young children, dried fish powder can enhance the nutrition and flavor of traditional dishes for vulnerable older children, adolescents, and adults. This is in-line with ongoing

initiatives by the Government of Zambia to promote dietary diversity to enhance household's nutrition security.

In addition to complementary feeding practices for infants and young children, we support and encourage:

1. Breastfeeding within the first hour of life;
2. Breastfeeding exclusively for the first six months of life;
3. Introduction of nutritious semi-solid and solid foods at six months of age;
4. Continued breastfeeding up to two years of age and beyond.

The Government of Zambia commits to work with its stakeholders—including the donor community, the private sector, research organizations, academia, not-for-profit organizations, and local communities—to ensure a sustainable and resilient value chain for pelagic whole small fish. A resilient value chain that works for all income brackets will ensure that all households

have easy access to protein and micronutrient-dense pelagic whole small fish.

This ComFA+Fish recipe booklet is intended for resource-limited urban and rural mothers and for staff of ministries and non-governmental organizations (NGOs) that provide health and nutrition care and services, and nutrition education within Zambia's health sector, educational sector (e.g., primary and secondary schools, tertiary institutions), and aquaculture and fish-based agri-food systems sectors. This ComFA+Fish recipe booklet can be used alongside other resources, such as the Improved Complementary Foods Recipe Booklet from the National Food and Nutrition Commission of Zambia (NFNC), to promote optimal dietary and feeding practices during the first 1,000 days of life to promote infants' and young children's cognitive and physical development across the lifespan.

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All ComFA+Fish recipes in this booklet are adapted from recipes developed by WorldFish and its partners in Zambia and Bangladesh. WorldFish leads the CGIAR Initiative on Aquatic Foods (Aquatic Foods, CGIAR), which is part of the primary CGIAR impact area of Nutrition, Health and Food Security and the CGIAR action area on Resilient Agrifood Systems. In addition to USAID and the Feed the Future Innovation Lab for Fish, we thank the Social Science Research Center, Mississippi

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Matuku
(*Oreochromis spp.*)

Nchenga
(*Brycinus spp.*)

Harnessing Knowledge that makes a difference

Fish powder
Kapenta
(*Limnothrissa spp.*)

Fish powder
Kapenta
(*Limnothrissa spp.*)

Fish powder
Kapenta
(*Limnothrissa spp.*)

Fish powder
Kapenta
(*Limnothrissa spp.*)

Fish powder
Kapenta
(*Limnothrissa spp.*)

Fish powder
Kapenta
(*Limnothrissa spp.*)

Fish powder
Kapenta
(*Limnothrissa spp.*)

Dried Small Fish Powder

This quick recipe for **Dried Small Fish Powder** is made from whole pelagic small fish that are dried, roasted, and ground into a fine powder. This fish powder can be added to a variety of dishes to improve their micronutrient and protein content. The fish powder can be made from a variety of pelagic small fish species such as Kapenta (*Limnothrissa miodon* and *Stolothrissa tanganicae*), Chisense (*Potamothrissa acutirostris* and *Poecilothrissa moeruensis*), Dagaa (*Rastrineobola argentea*), etc. Roasting the dried fish over low heat prior to grinding is recommended to lengthen the powder's shelf life and enhance the powder's flavor.

Ingredients

- 2 cups dried small fish
- 2 teaspoons salt (acts as a preservative)

Preparation

- Inspect the dried small fish and remove any that are discolored.
- Rinse the dried fish in clean water and pat dry.
- Roast the dried fish in a large wide-bottomed pan over low heat, stirring frequently, until golden brown (approximately 15 minutes).
- Remove the roasted dried fish from heat and allow to cool.
- Grind the roasted dried fish into a fine powder, using a mortar and pestle or commercial grinder.
- Sieve the resulting dried fish powder, and continue to grind the remaining powder into a uniformly fine powder.
- If adding salt (optional), thoroughly mix into the powder after grinding.
- Store product in an airtight container.

Servings

- Makes about 1 ½ cups of dried fish powder

Recommended Use

Dried Small Fish Powder is an easy-to-use nutritional powerhouse that is ideal for increasing the nutrient-density and flavor of recipes suitable children ages six (6) months and older, adolescents, pregnant and lactating women, and other adults.

Adapted from:

1. Ahern M, Mwanza PS, Genschick S, Thilsted SH. (2020). Nutrient-rich foods to improve dietary quality in the first 1000 days of life in Malawi and Zambia: Formulation, processing and sensory evaluation. Penang, Malaysia: WorldFish. Program Report: 2020-14. <https://fish.cgiar.org/wp-content/uploads/2021/12/686ccf608f5b874d6896db822c8c8ba85.pdf>
2. WorldFish. (2017). Fish-based recipes: Promoting the consumption of nutrient-rich small fish species in Zambia. Penang, Malaysia: WorldFish. http://pubs.iclam.net/resource_centre/2017-35.pdf



Complementary Maize Porridge

ComFA+Fish Complementary Maize Porridge is a complementary food for infants and young children that is made from small pelagic fish that have been dried, roasted and ground into a fine powder and cooked with ground white maize meal, groundnut powder, and orange-fleshed sweet potato (OFSP) powder (or other sweet potato powder if OFSP powder is unavailable locally) into a nutrient-dense porridge. The fish powder can be made from a variety of pelagic small fish species such as Kapenta (*Limnothrissa miodon* and *Stolothrissa tanganicae*), Chisense (*Potamothrissa acutirostris* and *Poecilothrissa moervensis*), Dagaa (*Rastrineobola argentea*), etc. Roasting the dried fish over low heat prior to grinding is recommended to lengthen the powder's shelf life and enhance the dish's flavor.

Ingredients

- 1 cup roasted dried small fish powder
- 1 cup groundnut powder (or ½ cup peanut butter)
- 1 cup orange-fleshed sweet potato powder
- 4 cups ground white maize meal (or more as needed)
- 2 tablespoons sugar (optional)
- 2 teaspoons salt (optional)
- 16 cups water (or more as needed)

Preparation

- In a bowl, thoroughly combine all the dry ingredients.
- Slowly mix 2 cups of water into the dry ingredients to make a smooth paste.
- In a large pot, bring 14 cups of water to boil.
- Slowly stir the porridge paste into the boiling water and mix until completely smooth.
- Cook the porridge – stirring frequently to prevent scorching – for 15 minutes or until the porridge thickens to the desired consistency.
- Turn off heat, cover the pot, and allow the porridge to rest for 2-3 minutes. Serve hot.

Recommended Serving Size

- ½ cup (infants ages 6–11 months)
- ¾ cup (children ages 12–23 months)
- 1 cup (children ages 24 months and older, adolescents, pregnant and lactating women, other adults)

No. of Servings

- 16 (infants ages 6–11 months)
- 8 (children ages 12–23 months)
- 4 (children ages 24 months and older, adolescents, pregnant and lactating women, other adults)

Recommended Use

ComFA+Fish Complementary Maize Porridge is an easy-to-make, nutrient-dense, and flavorful meal or snack for children ages 6 months and older, adolescents, pregnant and lactating women, and other adults.

Adapted from:

1. Ahern M, Mwanza PS, Genschick S, Thilsted SH. (2020). Nutrient-rich foods to improve dietary quality in the first 1000 days of life in Malawi and Zambia: Formulation, processing and sensory evaluation. Penang, Malaysia: WorldFish. Program Report: 2020-14. <https://fish.cgiar.org/wp-content/uploads/2021/12/686ccf608f5b874d6896db822c8c8a85.pdf>
2. WorldFish. (2017). Fish-based recipes: Promoting the consumption of nutrient-rich small fish species in Zambia. Penang, Malaysia: WorldFish. http://pubs.iclam.net/resource_centre/2017-35.pdf



Savory Fish Chutney

ComFA+Fish Savory Fish Chutney is made from pelagic small fish that are consumed whole (fresh or dried) that are cooked with tomato, onion, bell pepper (red, yellow, green), and spices of choice, such as garam masala and chili powder. This dish can be made from a variety of species of fresh or dried pelagic small fish such as Kapenta (*Limnothrissa miodon* and *Stolothrissa tanganicae*), Chisense (*Potamothrissa acutirostris* and *Poecilothrissa moeruensis*), Dagaa (*Rastrineobola argentea*), etc. If using dried fish, roasting the dried fish over low heat prior to grinding is recommended to lengthen the powder's shelf life and enhance the dish's flavor.

Ingredients

- 2 cups dried small fish (or substitute fresh small fish)
- ½ cup vegetable oil
- 1 cup onion, diced
- 1 cup tomato, coarsely chopped
- 1 cup bell pepper (red, yellow, or green), diced
- 1 tablespoon garam masala (or to taste)
- ½ teaspoon chili powder (or to taste)
- 2 teaspoons salt (optional)

Preparation

- Inspect the whole small fish and remove any that are discolored.
- Rinse the whole small fish in clean water and pat dry.
- If using dried small fish, roast fish in a large wide-bottomed pan over low heat, stirring frequently, until golden brown (approximately 15 minutes).
- Heat the oil in a large pan, add the small fish and fry over medium heat for 10 minutes, stirring frequently.
- Add onion; continue frying for 10 minutes, stirring frequently.
- Add tomato and peppers; continue frying for 10 minutes, stirring frequently.
- Add garam masala, chili powder, and salt (optional); continue frying for 5 minutes, stirring frequently.
- Remove from heat. Serve hot.

Recommended Serving Size

- ½ cup (children ages 24 months and older)
- 1 cup (adolescents, pregnant and lactating women, other adults)

No. of Servings

- 12 (children ages 24 months and older)
- 6 (adolescents, pregnant and lactating women, other adults)

Recommended Use

ComFA+Fish Savory Fish Chutney is an easy-to-make, nutrient-dense, and flavorful meal or snack for children ages 24 months and older, adolescents, pregnant and lactating women, and other adults.

Adapted from:

1. Aherm M, Mwanza PS, Genschick S, Thilsted SH. (2020). Nutrient-rich foods to improve dietary quality in the first 1000 days of life in Malawi and Zambia: Formulation, processing and sensory evaluation. Penang, Malaysia: WorldFish. Program Report: 2020-14. <https://fish.cgiar.org/wp-content/uploads/2021/12/686ccf608f5b874d6896db822c8c8a85.pdf>
2. WorldFish. (2017). Fish-based recipes: Promoting the consumption of nutrient-rich small fish species in Zambia. Penang, Malaysia: WorldFish. http://pubs.iclarm.net/resource_centre/2017-35.pdf







Savory Pumpkin Leaves

ComFA+Fish Savory Pumpkin Leaves is a savory dish made from small pelagic fish that have been dried, roasted and ground into a fine powder and cooked with fresh or dried pumpkin leaves or other nutrient-dense dark green leafy vegetables (DGLV) such as sweet potato leaves, spinach, collard greens, rape/kale, arugula/rocket, etc. The fish powder can be made from a variety of pelagic small fish species such as Kapenta (*Limnothrissa miodon* and *Stolothrissa tanganicae*), Chisense (*Potamothrissa acutirostris* and *Poecilothrissa moeruensis*), Dagaa (*Rastrineobola argentea*), etc. Roasting the dried fish over low heat prior to grinding is recommended to lengthen the powder's shelf life and enhance the dish's flavor.

Ingredients

- ½ cup roasted dried small fish powder
- 2 cups pumpkin leaves, sweet potato leaves, or other DGLV (fresh or dried)
- 1 cup groundnut powder (or ½ cup peanut butter)
- ½ teaspoon baking soda
- 3 cups of water
- 2 cups tomato, coarsely chopped
- 1 cup onion, diced
- ½ teaspoon chili powder (or to taste)
- 1 teaspoon salt (optional)

Preparation

- If using dried pumpkin leaves, soak in clean warm water for 30 minutes to rehydrate.
- Rinse the dried pumpkin leaves to remove any grit and place in large pot.
- Add the water and baking soda, stir to combine, and cook over medium heat for approximately one (1) hour.
- Add the groundnut powder (or peanut butter), stir to combine, and cook over low heat, stirring continuously to prevent scorching.
- When mixture begins to boil, add tomato, onion, chili powder, and salt (optional).
- Simmer for 10 minutes.
- Remove from heat. Serve hot.

Recommended Serving Size

- ¼ cup (infants ages 6–11 months)
- ½ cup (children ages 12–23 months)
- 1 cup (children ages 24 months and older, adolescents, pregnant and lactating women, other adults)

No. of Servings

- 12 (children ages 6–11 months)
- 8 (children ages 12–23 months)
- 6 (children ages 24 months and older, adolescents, pregnant and lactating women, other adults)

Recommended Use

ComFA+Fish Savory Pumpkin Leaves is an easy-to-make, nutrient-dense, and flavorful meal or snack for children ages 6 months and older, adolescents, pregnant and lactating women, and other adults.

Adapted from:

1. Ahern M, Mwanza PS, Genschick S, Thilsted SH. (2020). Nutrient-rich foods to improve dietary quality in the first 1000 days of life in Malawi and Zambia: Formulation, processing and sensory evaluation. Penang, Malaysia: WorldFish. Program Report: 2020-14. <https://fish.cgiar.org/wp-content/uploads/2021/12/684ccf608f5b874d6896db822c8c8a85.pdf>
2. WorldFish. (2017). Fish-based recipes: Promoting the consumption of nutrient-rich small fish species in Zambia. Penang, Malaysia: WorldFish. http://pubs.iclarm.net/resource_centre/2017-35.pdf



Bean-Vegetable Soup

ComFA+Fish Bean-Vegetable Soup is a savory dish made from whole pelagic small fish that have been dried, roasted and ground into a fine powder and cooked with dried bean powder and pumpkin leaf powder or another dark green leaf vegetable (DGLV) powder of choice (such as powdered sweet potato leaves, powdered spinach leaves, etc.). The dish also includes dried mushroom powder (any mushroom variety of choice), as well as onion powder, cassava flour, soybean flour, garlic powder, and vegetable oil. The fish powder can be made from a variety of pelagic small fish species such as Kapenta (*Limnothrissa miodon* and *Stolothrissa tanganicae*), Chisense (*Potamothrissa acutirostris* and *Poecilothrissa moeruensis*), Dagaa (*Rastrineobola argentea*), etc. Roasting the dried fish over low heat prior to grinding is recommended to lengthen the powder's shelf life and enhance the dish's flavor.

Ingredients

- 1 cup roasted dried small fish powder
- 3 tablespoons pumpkin leaf powder or other DGLV powder (from sweet potato leaves, spinach leaves, collard greens, rape/kale, etc.)
- 3 tablespoons mushroom powder (any mushroom variety)
- 2 tablespoons dried bean powder
- 2 tablespoons onion powder
- 1 tablespoon cassava flour
- 1 tablespoon soybean flour
- 1 teaspoon garlic powder
- 1 teaspoon salt (optional)
- 2 cups water
- 3 tablespoons vegetable oil

Preparation

- In a bowl, thoroughly mix all the dry ingredients.
- Pour two cups of water in a pot and on high heat, slowly add the mixture of dry ingredients to the pot while stirring continuously to avoid lumps.
- Bring the mixture to boil and cook for approximately 15 minutes. Stir frequently to avoid scorching.
- Add more water, as needed, until the soup is slightly thickened and has reached the desired consistency.
- Drizzle the vegetable oil into the soup in a thin stream, stirring to thoroughly mix.
- ComFA+Fish Bean-Vegetable Soup can be eaten warm or hot.

Recommended Serving Size

- ½ cup (infants ages 6–11 months)
- ¾ cup (children ages 12–23 months)
- 1 cup (children ages 24 months and older, adolescents, pregnant and lactating women, other adults)

No. of Servings

- 12 (infants ages 6–11 months)
- 8 (children ages 12–23 months)
- 6 (children ages 24 months and older, adolescents, pregnant and lactating women, other adults)

Recommended Use

ComFA+Fish Bean-Vegetable Soup is an easy-to-make, nutrient-dense, and flavorful meal or snack for children ages 6 months and older, adolescents, pregnant and lactating women, and other adults.

Adapted from:

1. Ahern M, Mwanza PS, Genschick S, Thilsted SH. (2020). Nutrient-rich foods to improve dietary quality in the first 1000 days of life in Malawi and Zambia: Formulation, processing and sensory evaluation. Penang, Malaysia: WorldFish. Program Report: 2020-14. <https://fish.cgiar.org/wp-content/uploads/2021/12/684ccf608f5b874d6896db822c8c8a85.pdf>
2. WorldFish. (2017). Fish-based recipes: Promoting the consumption of nutrient-rich small fish species in Zambia. Penang, Malaysia: WorldFish. http://pubs.iclarm.net/resource_centre/2017-35.pdf



Savory Cassava Bites

ComFA+Fish Savory Cassava Bites are an easy side dish or snack made from dried small fish powder, cassava flour, orange-fleshed sweet potato (OFSP) powder, and spices such as ginger powder and dried curry leaves. The fish powder can be made from a variety of pelagic small fish species such as Kapenta (*Limnothrissa miodon* and *Stolothrissa tanganicae*), Chisense (*Potamothrissa acutirostris* and *Poecilothrissa moeruensis*), Dagaa (*Rastrineobola argentea*), etc. Roasting the dried fish over low heat prior to grinding is recommended to lengthen the powder's shelf life and enhance the dish's flavor.

Ingredients

- ½ cup roasted dried small fish powder
- 2 ¼ cups cassava flour
- 12 pieces dried curry leaves, crushed into fine pieces
- ¼ cup onion powder
- 3 teaspoons sugar
- 2 teaspoons orange-fleshed sweet potato powder
- 2 teaspoons Irish potato powder
- 2 teaspoons ginger powder
- 2 teaspoons garlic powder
- 2 teaspoons salt (optional)
- 2 cups water (or more as needed)

Preparation

- Mix all the dry ingredients in a bowl.
- Add the water and gently mix just until the water and dry ingredients are barely combined: overmixing causes the dough to have a tough texture.
- Gently shape the dough into 50 round bites, each approximately 2 inches in diameter.
- Pre-heat the vegetable oil in a deep pot until it reaches 191 degrees Celsius.
- Deep fry a few bites at a time until golden brown and crispy on the outside, turning frequently with a slotted utensil to ensure even browning. The oil needs to maintain 191 degrees Celsius. If the oil's temperature is too low, the cassava bites will absorb too much oil. If the oil's temperature is too high, the outside of the cassava bites will burn before their centers are fully cooked.
- Check one cassava bite in the batch to ensure that its center is fully cooked.
- Savory Cassava Bites can be eaten warm or at ambient temperature.

Recommended Serving Size

- ½ Savory Cassava Bite (infants ages 6–11 months)
- ¾ Savory Cassava Bite (children ages 12–23 months)
- 1 Savory Cassava Bite (children ages 24 months and older)
- 2 Savory Cassava Bites (adolescents, pregnant and lactating women, other adults)

No. of Servings

- Recipe makes 50 Savory Cassava Bites

Recommended Use

ComFA+Fish Savory Cassava Bites are an easy-to-make, nutrient-dense, and flavorful side dish or snack for children ages 6 months and older, adolescents, pregnant and lactating women, and other adults.

Adapted from: WorldFish. (2022). Nutrient-rich small fish production, processing and marketing in Myanmar and Zambia (SPM). Penang, Malaysia: WorldFish. <https://worldfishcenter.org/project/nutrient-rich-small-fish-production-processing-and-marketing-myanmar-and-zambia-spm>



Nutri-Biscuits

ComFA+Fish Nutri-Biscuits are a nutrient-dense snack made from dried fish powder, cake flour, orange-fleshed sweet potato (OFSP) powder, cassava flour, and other tasty ingredients. The fish powder can be made from a variety of pelagic small fish species such as (*Limnothrissa miodon* and *Stolothrissa tanganicae*), Chisense (*Potamothrissa acutirostris* and *Poecilothrissa moervensis*), Dagaa (*Rastrineobola argentea*), etc. Roasting the dried fish over low heat prior to grinding is recommended to lengthen the powder's shelf life and enhance the dish's flavor.

Ingredients

- 1 cup roasted dried small fish powder
- 1 ½ cups cake flour
- 6 tablespoons white sugar
- 3 tablespoons orange-fleshed sweet potato powder
- 3 tablespoons milk powder
- 3 tablespoons cassava flour
- ½ teaspoon baking powder
- ¼ teaspoon salt (optional)
- 1 egg
- ½ cup vegetable oil
- 1 teaspoon vanilla

Preparation

- Preheat oven to 176 degrees Celsius.
- In a large bowl, mix all the dry ingredients and stir to thoroughly combine.
- Add 10ml of water and mix thoroughly with the dry ingredients to form a soft dough.
- In a small bowl, beat the egg, then slowly beat in the vegetable oil and vanilla until combined.
- Add the egg mixture to the dough and mix gently until smooth.
- Let the dough rest for 10 minutes.
- Roll out the dough to a thickness of ¼ inch and cut into shapes of your choice.
- Place in oven and bake at 176 degrees Celsius for one hour or until the biscuits are a deep golden brown.
- ComFA+Fish Nutri-Biscuits can be eaten warm or at ambient temperature.

Recommended Serving Size

- 1 Nutri-Biscuit (children ages 12–23 months)
- 2 Nutri-Biscuits (children ages 24 months and older)
- 3 Nutri-Biscuits (adolescents, pregnant and lactating women, other adults)

No. of Servings

- Recipe makes 60 Nutri-Biscuits

Recommended Use

ComFA+Fish Nutri-Biscuits are an easy-to-make, nutrient-dense, and flavorful snack for children ages 12 months and older, adolescents, pregnant and lactating women, and other adults.

Adapted from: WorldFish. (2022). Nutrient-rich small fish production, processing and marketing in Myanmar and Zambia (SPM). Penang, Malaysia: WorldFish. <https://worldfishcenter.org/project/nutrient-rich-small-fish-production-processing-and-marketing-myanmar-and-zambia-spm>





